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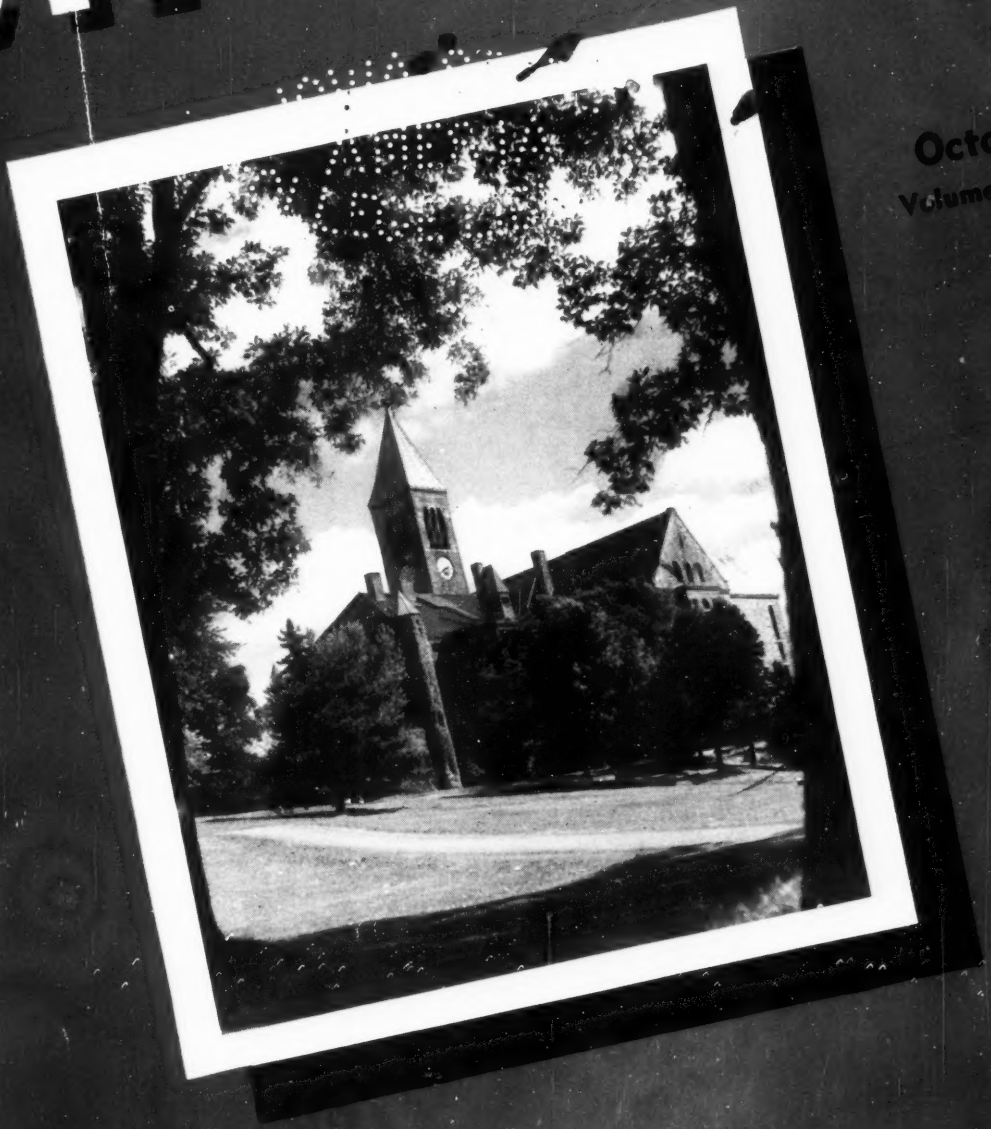

October, 1943
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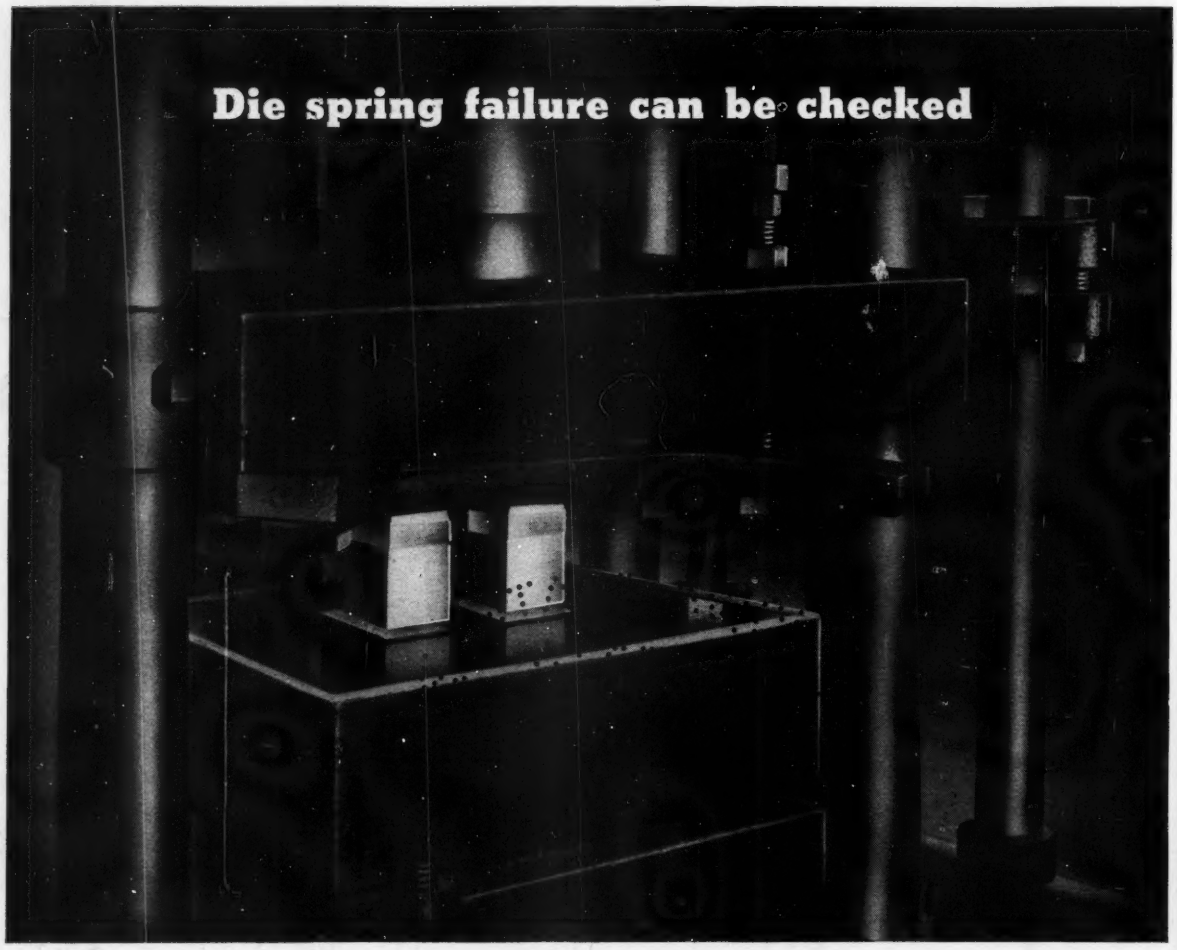
COLLEGE OF ENGINEERING · CORNELL UNIVERSITY

Die spring failure can be checked



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A recent investigation of die spring breakage developed the following prominent causes:

1. Hydrogen embrittlement resulting from plating, pickling or cleaning.
2. Incorrect die design.
3. Incorrect spring size.
4. Speed of compression cycle.
5. Poor quality of wire.

There are, fortunately, remedies for all these conditions. Hydrogen embrittlement can be corrected by heating plated springs to about 450°F. and air cooling.

Faults in die design usually consist of either insufficient or too great clearance between the outside diameter of the spring and the guide hole. The clearance should be such that the spring operates freely, but has no chance to buckle.

Care should be taken in selecting springs to see that they are properly designed for both length of compression stroke and speed of compression. If springs are repeatedly compressed too close to their solid height, quick failure will result. The same is true where the rapidity of compression is too great.

It seems obvious that the quality of the spring wire should be commensurate with the job. Cheap wire should be avoided because of defects that are bound to cause trouble, especially when springs are plated.

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Olsen Universal Testing Machine In Mech Lab

For a plan to acquire additional laboratory equipment; see page 16

The president of the Fairchild Engine and Airplane Co. looks over World War II and points out a lesson it teaches for the future . . .

Stukas Weren't Enough

By J. CARLTON WARD, JR., M.E., '14

—*Weber*

J. Carlton Ward, Jr.

THE war has entered a new phase. The United Nations today are on the offensive. The tide has turned. And we in America now come to the startling realization that our democracy has been saved by a set of fortuitous circumstances.

Because Hitler failed to follow through after Dunkirk, because the Japs failed to march in after Pearl Harbor, because the aviation industry of Britain and America adopted the principle of day-to-day development and improvement of aerial combat craft to meet *all* types of aerial warfare, because the air strategists of Germany failed to foresee the necessity of fighting a defensive war, the victorious conclusion of this conflict seems to be in the not too distant future.

Perhaps it is a surprise to many people to realize how many mistakes Hitler has made in his war preparations. First, he committed the unpardonable error of guessing wrong as to where the war would finally be fought and won. Secondly, he made the unpardonable error of under-rating the ability and strength of his potential enemies.

Thus, he approached his aviation problem with the idea that he could freeze his designs, assuming that his designs, carefully developed in the years before the war, would suit the ever-changing strategy of the war as it progressed. He guessed wrong because he thought it would be a blitzkrieg; a lightning war—fast, furious and quickly ended. It wasn't a blitzkrieg. And after he had completed the phase of overrunning enemies who were ill-prepared for his long-planned attack, he then found himself confronted with the problem of waging war in territories that had not been included in his original plans.

THE AUTHOR

After receiving his M.E. degree from Cornell in 1914, Mr. Ward became a development engineer for the International Paper Company. During the first World War he occupied a post in the U. S. Ordnance Department, following which he became connected with United Aircraft; during the next twenty years he held various positions with both that corporation and the Pratt and Whitney Company.

In 1940, he assumed the position of president of the Fairchild Engine and Airplane Corporation, which he now holds. Mr. Ward is also a member of the Engineering College Council of Cornell University.

These territories, in many cases, were overseas, and he had not prepared for an overseas war. His navy, like his air force, did not consist of all types of weapons, but had a predominant accent on submarines and small, fast craft essentially defensive in character. He had assumed, in developing the "pocket battleship", that he had a new formula which rendered somewhat obsolete the older forms of naval weapons. But the Graf Spee proved to be vulnerable to craft of inferior fire power when intelligently directed by officers capable of making use of the new and improvised tactics which he had not foreseen.

His aviation material had been designed to coordinate an offensive with his highly developed army; and furthermore, against nations which he assumed to be weak defensively in their own aircraft. It worked fine while it lasted. Against the Poles his aerial reconnaisance, followed by short range bombing, destroyed the enemy's limited air force and allowed him methodically to trap the Polish armies and destroy Poland's centers of population. The destruction of Warsaw demonstrated a new concept of total war.

But for the most part his fighter planes were weak in defensive armament; his Stukas—one of his horror weapons, with its frightening scream and deadly fire and destructiveness against helpless congestions of ground troops, civilians and supply lines—looked very well when confronted with no formidable aerial opposition or modern anti-aircraft opposition. But they were slow and later proved to be so vulnerable that they are now practically obsolete. His bombers were

Hitler's horror weapon—Obsolete!

"A nation . . . to be prepared . . . must have th

small, badly armed, short ranged, and weak defensively. Here again he thought of a continental war, with his enemies close to his own air fields and supply lines. Nazi industry had been set up on the theory of static designs and production in quantity, without excessive interference from design modifications. Only recently has he developed the FW-190 and his four-engine long range bombers. He still uses what is left of his JU-52s, a slow and vulnerable transport, for aerial supply lines along with many of the older designs with which he started his blitzkrieg.

And now we learn, through Intelligence reports, that he is frantically diverting his diminishing productive capacity from the construction of bombers and offensive aircraft to the construction of defensive fighters, because of the aerial onslaught of the allies on his homeland.

Preparation In All Fields

It is an old axiom of war that to be prepared, an efficient nation must have the best of *all* classes of weapons. Production must follow the trend in the use of weapons. Weapons of war are expendable. Development must go on in *all* fields. For in war, one never knows ahead of time what can happen through sudden changes in the over-all strategic situation. Thus we find ourselves putting aside defensive weapons and giving priority to offensive weapons. This is having a far reaching effect on the aviation industry.

Early in our own preparation there were two schools of aeronautical thought. One believed that we should freeze the designs of our aircraft in order to produce in quantity. The second believed that we should make no sacrifice to having the best, for it was considered very unhealthy to be in the air, facing an enemy, when you were sitting in the second best airplane. Fortunately, the latter school of thought prevailed. It gained great confidence when Britain won the Battle of Britain so bravely with a few aircraft of high quality, standing off a multitude of Germany's quantity-produced airplanes. True, that battle introduced Radar, which Britain had developed secretly to an extraordinary degree. Radar allowed Britain's few aircraft to be in the air where and when needed and not shot to pieces on the ground as was the case in Poland which had no knowledge of where and when the enemy would strike.

As we look backward it becomes clearer with every passing day of aerial warfare that the aircraft industry must dedicate itself to an ever-increasing effort in development. We can now see the strength of the Allied position. Britain, living close by her enemies, has been developing bombers capable of carrying enormous loads for medium distances and fighter airplanes with tremendous rates of climb, able to rise and meet the enemy and destroy him on short notice.

America, with her different geography and her different approach to war, has been developing large bombers capable of going great distances to meet the enemy, equipped with the most powerful defensive armament known to ward off enemy fighters, and able to drop bombs in daylight with new records of precision from very high altitudes. She has been developing an outstanding group of naval planes designed to strike heavy blows far from home bases.

We have seen American-developed fighters which were rugged enough to withstand tremendous abuse in the air and still reach their objective or stay in the air slugging it out to bring their pilots home safely. These fighters were given as much range as possible while still keeping them in the fighter class.

Another Contribution

America made another real contribution in the field of light and medium bombing where its two-engine bombers, in many instances, had the speed and maneuverability of fighters and could still strike heavy blows on ground objectives from their bomb racks. She also contributed the high-level-precision long-range heavy bomber and an outstanding group of specialized airplanes for naval use.

Britain developed the defensive night fighter, and the revolutionary power gun turret so necessary during the latter stage of the Battle of Britain and, again, used her great knowledge of Radar in the development of specialized aircraft for new and ever-changing aerial warfare.

In this country we have frequently heard the question posed "Is the so-and-so airplane the finest fighter in the world?" As I have often said, there is no such thing as the best fighter or best bomber, because both the fighter and the bomber have so many different types of missions to perform. For instance, there are low-level fighters, high-level fighters, interceptor fighters, convoying fighters, hit-

"ALL classes of weapons . . . Development must go on" "Material of modern war is developed in peacetime"

and-run fighters and ground-strafing fighters. Naturally, if you are interested in interception, rate-of-climb becomes the most important criterion. If you are interested in convoying, range becomes the important criterion. If you are interested in defensive fighting, speed, maneuverability and fire-power become the criteria.

But you can't have all of these at once. And so the designer of each aircraft must weigh the importance of all the relative factors of airplane design and produce an airplane for the purpose. When the airplane is used for that purpose, it will be an excellent weapon. But if it is used for another purpose, the results will not be as satisfactory, though the aircraft may possibly be very useful. Thus it can be seen how much of the ill-timed, poorly-thoughtout criticism of American aircraft has come about—criticism which has caused a great deal of damage to morale among the home folk and, in some cases, among the pilots themselves.

Comparisons Impossible

This has been extremely unfortunate and unfair, and I was delighted to find that the British Ministry of Aircraft Production realized that it was impossible to compare an American type and a similar British type and pronounce one better than the other—unless both were created for the same purpose. Again I come to the conclusion that we can be thankful each nation has brought to this great problem of global aerial warfare its own distinctive approach and that together we are definitely more powerful than those who oppose us.

When you add together the fighting air fleet of Britain and the fighting air fleet of America, each consisting of planes developed for specific but unlike purposes, you must be impressed with the fact that the Allied Nations are equipped for global aerial warfare to a degree unknown to our enemies. It is highly improbable that any one nation could have developed such a mass and variety of equipment solely by its own efforts. It is more remarkable that these results were obtained in the face of the small peacetime appropriations for development work—development work which, as has already been said, formed the background of experience and technique from which all of this highly perfected material has sprung.

And now that the war has turned and we feel we are in the straight road to Victory, it is time to review the lessons which experience teaches, for as citizens it is our obligation to decide the policies of government in relation to the maintenance of our military forces. We would be foolish, indeed, if we shut our eyes to the fact that in this war we have been saved by a series of unanticipated events. For now, most of us realize that our military record from the Revolution to the naval War of 1812, to the Mexican War, to the Civil War, to the Spanish-American War, to World War I and, lastly, to World War II, has been a complete record of military unpreparedness. In each of these conflicts we have been saved by one or another twist of fortune and while we take great pride in being a nation that has never lost a war, it is doubtful indeed if this record could be maintained under the policy of pacifism and disarmament which has governed us as a people throughout peacetime eras.

So, as we thoughtfully look back, let us learn from our own history and prepare for World War III. Let that preparation be for an entirely different purpose, bearing in mind that the materiel of modern war is developed in peacetime.

Flying Fortress

The Flying Fortress was developed in 1935 and this remains today our most potent offensive weapon in the air. Our Warhawks, Airacobras, Lightnings, Marauders, Mitchells, Wildcats, Avengers, Catalinas, and many others, all sturdy weapons in the air today, were all pre-war developments. Had it not been that for two years our Allies bought equipment in this country and allowed us to perfect our facilities and weapons, we would have been found with most of these weapons absent when Pearl Harbor cracked down upon us.

And so, let us ask ourselves the question whether we want to depend on *fortuitous circumstances* to save us again, or whether America, armed and ready, shall speak with a voice so loud that the international bullies of the future will pause and decide that the odds are so against them that their sense of self-preservation will force them to negotiate in peace and be content with the world's judgment.

In short, if we Americans, in the peace that lies ahead, prepare for World War III with thoughtful adherence to our experiences and lessons of the past, World War III will in all probability never be fought.

An absorbing first-hand account of recent flood conditions in six central states . . .

A Trek in the Wake of Floods

By L. D. DOTY

Associate Professor of Hydraulic Engineering

IN May of this year some very extraordinary floods occurred in the central Mississippi Valley. These floods were local in nature and while very severe at certain focal points, their total volumes were absorbed by the great valley storage capacity fortunately available in the lower reaches of the "Father-of-Waters". For this reason the resulting devastation, although severe, was not wide spread and in comparison to the far greater disasters occurring almost hourly in the prosecution of the present war, it is understandable how these floods were relegated to second page comments in newspapers outside of the immediately affected communities. Loss of life involving only about a score, of which less than half were military personnel, and losses estimated at approximately $200,000,000, amount to only a drop in the bucket when compared with the war's daily casualty lists and costs.

A glance at the accompanying map indicates that the floods in question were confined generally to the lower Arkansas, Missouri, and Ohio river valleys, together with the intervening section of the Mississippi. The states essentially involved were Oklahoma, Arkansas, Kansas, Missouri, Illinois and Indiana. Between May 7 and May 20, heavy rain storms prevailed over these areas, progressing in their usual path from the southwest Gulf Coast towards the Great Lakes region. In many localities throughout this region, unprecedented rainfall was recorded and maximum surface run-off and river stages attained.

Since these conditions occurred just prior to the closing of the spring term at Cornell, the writer developed an urge to tramp out the flood's wake and thereby revitalize his present professional endeavor. W. L. Malcolm, Director of the School of Civil Engineering, endorsed the idea and cooperated in every way to make such a trip possible. Prior telegraphic permission to enter the flood zones was secured from General T. M. Robins, Acting Chief of Engineers, U. S. Army, Washington, D. C., and from the District Engineers in the localities concerned. During flood disasters the U. S. Engineer Corps automatically assumes basic authority in the areas affected. A circle tour was decided upon with focal stops scheduled for the U. S. District Engineer Offices at Louisville, Memphis, Little Rock, Tulsa, Kansas City, St. Louis and Cincinnati.

THE AUTHOR

Professor L. D. Doty took up his duties at Cornell as Associate Professor of Hydraulic Engineering just a year ago, following the retirement of Professor F. J. Seery. Professor Doty took his undergraduate work at Denison University, Granville, Ohio. He obtained his M. S. in C. E. and C. E. professional degree from the University of Illinois. His professional experiences include municipal, railroad and flood control engineering, together with a four year period of university teaching. The accompanying article reflects his eight years of service with the U. S. Engineering Department on flood control work in the Ohio and Arkansas Valleys.

No flood conditions were experienced on the Ohio River at Louisville, but the Louisville District includes the Wabash River which forms the southern portion of the common boundary between the states of Illinois and Indiana. Col. H. F. Hannis, District Engineer, was most cordial and through his civilian engineer staff made a considerable amount of flood data available. This office has an excellent group of hydraulic engineers who are out in front with the most recent flood studies and control developments. No inspection of the Wabash flood area was made at the time since it was more conveniently included at the end of the tour.

The Memphis Engineer District extends up the Arkansas Valley to the limits of the Mississippi backwater, about 40 miles below Little Rock. The Arkansas River flood had passed into the Mississippi several days ahead of the floods produced by the Missouri and Ohio streams, due to the several hundred miles difference in travel distance along the Mississippi's winding course; so no synchronization of these flood flows was involved at the mouth of the Arkansas.

As most of the highways throughout the flooded parts of the district had just been opened to traffic, Col. J. J. Bain, present Memphis District Engineer, very kindly provided a car and chauffeur for an inspection of the lower St. Francis, White, and Arkansas Valleys. The chauffeur, Mr. Ollie R. Robinson is an "old-timer" with the Memphis Office. Upon inquiry as to how he knew just where to go he replied that since he had driven General Eugene Reibold, Chief of Engineers, over the same route just three days before, he figured a Cornell prof would probably be interested in the same things. It goes without saying that the chauffeur was well provided with cigars, cigarettes, drinks and what-not, from then on through-

out his part of the trip.

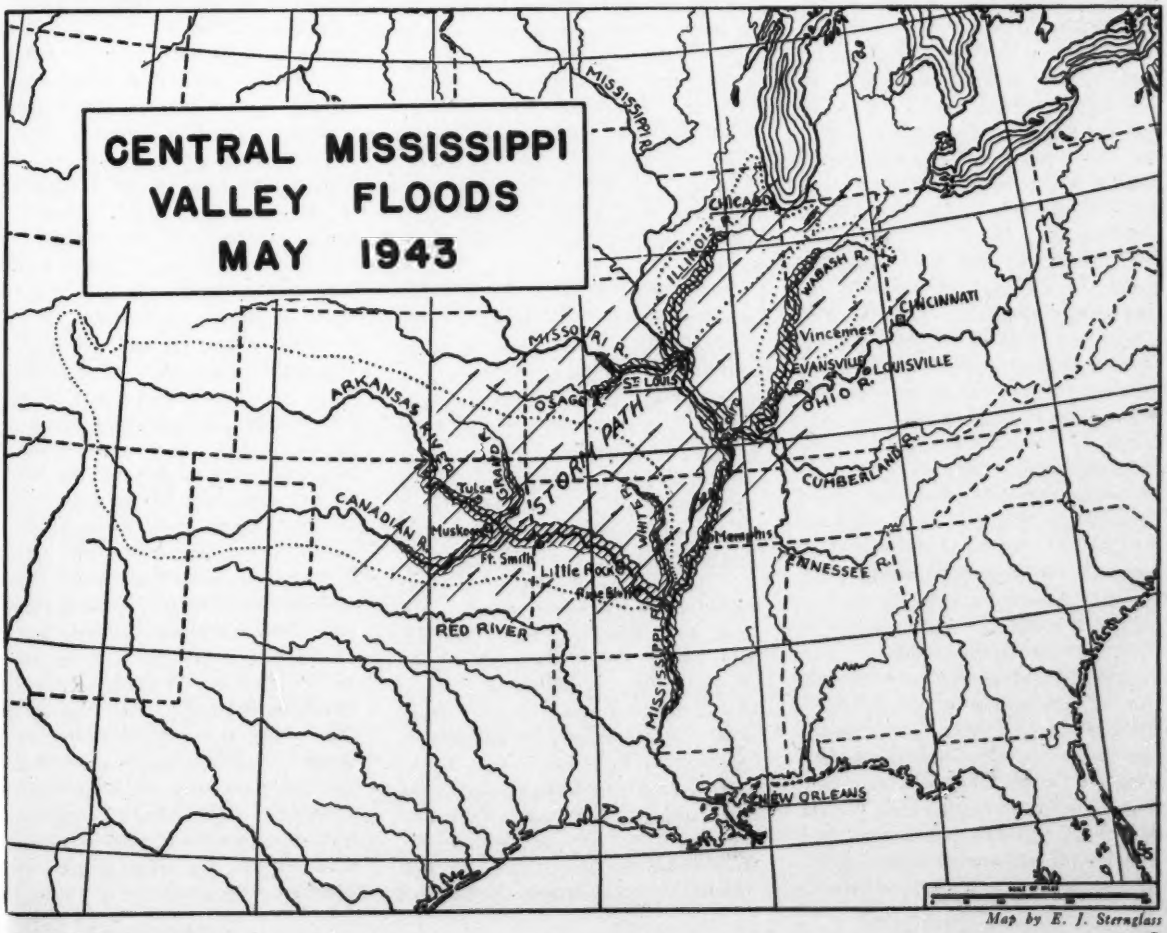
The St. Frances River, the first stream crossed after leaving the Mississippi, was running bank full as it had for the past three weeks. It parallels the Mississippi about thirty miles west of Memphis. Its flood-flow was perfectly controlled by the Wappepello Dam recently constructed on its head waters in Missouri.

The White River was a different story. It heads in the Ozark Mountains to the northwest, and it was still very high, having receded only about two feet from its crest which had occurred on May 31. A field engineer provided speedboat transportation at DeValls Bluff for a trip to Peach Orchard Bluff and vicinity about ten miles upstream. Here a flood fight had been successfully waged by a large contingent of engineer troops by means of sand-bagging the top of several miles of levees. The trip up the flooded river was probably the most interesting of the entire itinerary. Riding the middle of a great river in flood gives one a much better concept of just how big and seemingly without limit a flood really is. The thrill of the ride was materially heightened when the coxswain steered directly through a fairly deep forest to short cut a wide bend in the river. The sudden rush from the open expanse of the river into the woods-tunnel and weaving a way through the sycamores and pines at a speed of some 20 miles per, produces the sensation of riding the flying carpet through the spires of Bagdad with a high trust in Allah and the weavers art.

Levees Raised 3 Feet

Seemingly unending miles of levees had been raised the required three extra feet and thousands of acres of cotton, peanuts, and corn were saved from complete loss, not to mention the many farm homes involved. The actual filling and placing of the bags was done by the engineer troops brought in by river steamer. The work was supervised by Memphis District civilian engineers who provided the real "know-how" on the job. Even the age old sacking had the special "Memphis feature" of filling the burlap bags only two-thirds full and placing them in such a way as to allow the untied loose end to form a flat cloth bond into the next adjacent course of the sandbag wall. These really beautiful works called for photographs, but due to possible military complications it was not practicable to make use of the camera.

Here also were some excellent examples of proper stopping and sand-boils, a few of which had developed at the base of the levee. These are caused by the high hydrostatic head on the river side forcing a piping condition, generally through old root holes in the levee's subgrade which had not been eliminated at the time of construction. When a sand-boil breaks and water begins to bubble up in appreciable quantities, no attempt is made to plug the hole proper and thus possibly force some other outlet. The treatment instead is to ring the boil with a carefully constructed



Map by E. J. Sternglass

sandbag circular wall, allowing the water to rise in this well and build up its own back pressure against the flood head. This greatly reduces the velocity of the underflow and allows the flood mud to settle and actually plug the piping path. Generally the flows are completely stopped with a ring only a few feet high.

The obnoxious stench which rotting vegetation emits after inundation is uniquely foul. Several adjoining fields of spinach probably produced the most memorable reaction. The writer can compare it only to similar experiences in former flood-plain surveys.

Big Inch Pipeline Fixed

The next most interesting sight was the U by-pass pipe constructed to maintain the Big Inch pipe line which at the time had been completed between Long View, Texas, and Norris City, Illinois. It was carrying more than 300,000 barrels of crude oil per day to the Illinois terminal from which eastern distribution was made. This line crosses the Arkansas River at a point between Pine Bluff and Little Rock. The crossing itself is made in the usual manner by means of a deep ditch transversing the river bottom proper, but the installation has not been made deep enough to withstand the bottom scour of the Arkansas in one of its "maximum" floods. The first indication that a break had occurred was a serious drop in pressure at the nearest pumping station. An airplane patrol reported almost simultaneously that a large oil slick was moving down the river, so the valves on both banks of the river were closed immediately. Almost instantaneous closure of large transporting pipe lines is made possible by the provision of huge surge tanks at each pumping station and the use of a private and very efficient telephone system which is installed along the entire length of the pipe line right-of-way.

The same 24 inch pipe size could not be obtained locally, so a 20-inch temporary bypass was looped around a six mile detour utilizing a railroad bridge for the actual crossing of the river. This job was an excellent example of cooperation. There was no time to secure rights-of-way or to dicker over easements. The line was back in slightly curtailed service again within 48 hours.

It was necessary to take leave of Conductor-chauffeur Robinson at Little Rock as that is well into the Little Rock District Engineer's territory and under the jurisdiction of Col. A. M. Neilson, District Engineer. The head of the Reports Section, now Major F. O. Reeves, Executive Officer, was most cooperative in arranging for inspection of seriously flooded areas in the Little Rock District.

Probably the greatest destruction caused by the May floods occurred at Fort Smith, a city of about 50,000 located on the south side of the Arkansas River just east of the Oklahoma-Arkansas State line. Camp Chaffee, a large army training cantonment adjoins the east edge of the city. The river bottoms throughout this vicinity represent some of the nation's finest vegetable gardens. Potatoes and spinach predominate. The inspection throughout this locality was conducted by Paul E. Adams, Head of the Economics Section, Little Rock District.

Figure 1

The flood in this reach of river came in two definite stages. The first crest, which occurred May 13, was four feet higher than the greatest flood of record, a 38 foot stage which occurred in 1833 when Fort Smith was only a stockade outpost. The second crest came ten days later and also exceeded the 1833 stage.

Damage Was Extensive

The usual damage conditions prevalent with high flood were apparent on every hand. Homes had been floated from foundations. Household goods sodden with mud were piled high in the streets. Dead animals were being burned on location to prevent additional health hazard. Bridges were washed out and large sections of highways were missing or covered. Railroad tracks hung in long catenaries across openings where the roadbed had been. Some indication of the enormous loss of top soil is indicated in the accompanying picture (Fig. 1) of the man holding a plant with tap root still secure in the ground. Note that the plant proper is located at shoulder height, at least four feet higher than the present ground level. This originally fine piece of bottom land is now too shallow for proper vegetable cultivation and the four feet of top soil is a worthless addition to the Mississippi delta.

The city of Fort Smith and Camp Chaffee obtain regular water supply from a reservoir located across the Arkansas River in the Ozark foothills. The main supply pipe (27 in.) is carried over the river on the main highway bridge. The bridge proper and the pipe swung beneath its roadway deck were unharmed. The first flood, however, broke the conduit on the Fort Smith side of the bridge by cutting a new channel about 600 feed wide between the bridge and the city. A ponton (army spelling) company of engineer troops from Camp Chaffee constructed a float bridge across this gap and a temporary connection by means of three eight-inch pipes was made. Fig. 2 shows the ponton bridge with heavy steel treads to accommodate necessary traffic. Two of the temporary eight-inch lines were placed in the center, and the third line along the outside of the right tread. Note the temporary wood pile highway bridge being constructed at the right of the ponton bridge. Fig. 3 shows the temporary junction with the original water supply main on the land side of the new channel. The ponton bridge and the pipe lines it carried broke during the second crest and several sections were lost. The break was quickly closed however, and water service restored to the city and cantonment.

A two day stop was made in Tulsa. This section of the Arkansas River experienced a very severe flood, but losses here were comparatively not as extensive as those in the reaches further downstream. The Tulsa District Engineer, Col. F. J. Wilson, was out of the city but Majors D. P. Grosshans and M. W. Parse, were most cooperative in supplying general flood information.

Railroad Yards Flooded

A one day stop was made at St. Louis. Col. L. B. Feagin is the District Engineer there. Civilian engineers P. F. Maher and Byron Howard gave full cooperation in making flood data available. While the flood at St. Louis was not unusually high it did inundate a considerable section of the railroad yards and loading docks along the river front. While this did not cause serious direct damage to physical property, the indirect losses due to delayed shipments, adjacent railroad yard crowding, rerouting, and general traffic interruption, must have amounted to hundreds of thousands of dollars, for St. Louis is one of the country's largest terminals.

The U. S. Engineer Office at St. Louis maintains a very interesting profile map of historic floods on that reach of the Mississippi between the mouths of the Missouri and the Ohio Rivers. The greatest flood ever recorded in this reach was that in 1844. While the past May flood at St. Louis was several feet below the 1844 stage, its stage at Cape Girardeau, 130 miles downstream, exceeded the 1844 flood and thus it set an all time record for the Mississippi at that particular location.

In traveling by train across the great expanse of the Wabash River bottoms which extend several miles west of that stream in its reach near Vincennes, Indiana, the flood's enormous agricultural destruction was constantly apparent. Literally miles of grain and vegetable fields sent up their sodden stench of organic rot. Many days of sunshine would be required before plows could get in to turn this decomposition into the soil. Since there was fortunately very little evidence of soil scour, the flood damage entailed essentially the crops proper. Vincennes waged a successful flood fight that prevented inundation of the city proper.

Checking out of the flood area at the U. S. Engineer Office in Cincinnati was indeed a relief. Old time associates there, civilian engineers Nelson Fasnacht, A. A. Johnson, and H. P. Doverspike, arranged for an inspection trip to the Mill Creek Pumping Station. Here within the city limits the largest capacity pumps in the world are being installed in a flood protection project which will protect large industrial plants from inundation by backwater from the Ohio. These industries are now operating 24 hours a day manufacturing war material, and their uninterrupted production is a vital victory measure.

It would be impossible for anyone to make the above round of flood-wake inspection and not become fully convinced that the control of floods is this nation's outstanding engineering problem. As our population increases and our industrialization intensifies, the greater each successive flood loss will become. To those of us who have specialized in this division of civil engineering it presents a real professional challenge imbued with economic and humanitarian betterment.

A Plan Exists

The U. S. Corps of Engineers, through its various watershed districts, has a comprehensive plan for the control of floods throughout the Mississippi valley. These plans have been developed during the past ten years and their execution has had a good start in the reservoirs and levees completed within that time.

That part of the plan which would have relegated these May 1943 floods to insignificant freshets could have been built at a cost well within the range of the total losses resulting from these floods alone. But after the pangs of disaster are softened by an extended period of normal streamflow, and the losses have been written off under ". . . . . strikes, fires, floods, or acts of God," it is a difficult task to maintain in a people a genuine awareness of these potential dangers which are within their power to overcome through proper enterprise and legislation.

The sincere co-operation of each U. S. Engineer Office in making such an inspection trip possible to a flood-interested pedagogue reveals the hopes of the present engineers that our universities will not fail them in the preparation of the future engineers who will 'carry the ball' in the post-war period. A hearty thanks to these men. Cornell will do her part.

Figure 2

Figure 3

Glass is doing yeoman service these days—both as a substitute material and in its own right. . .

A Future For Glass

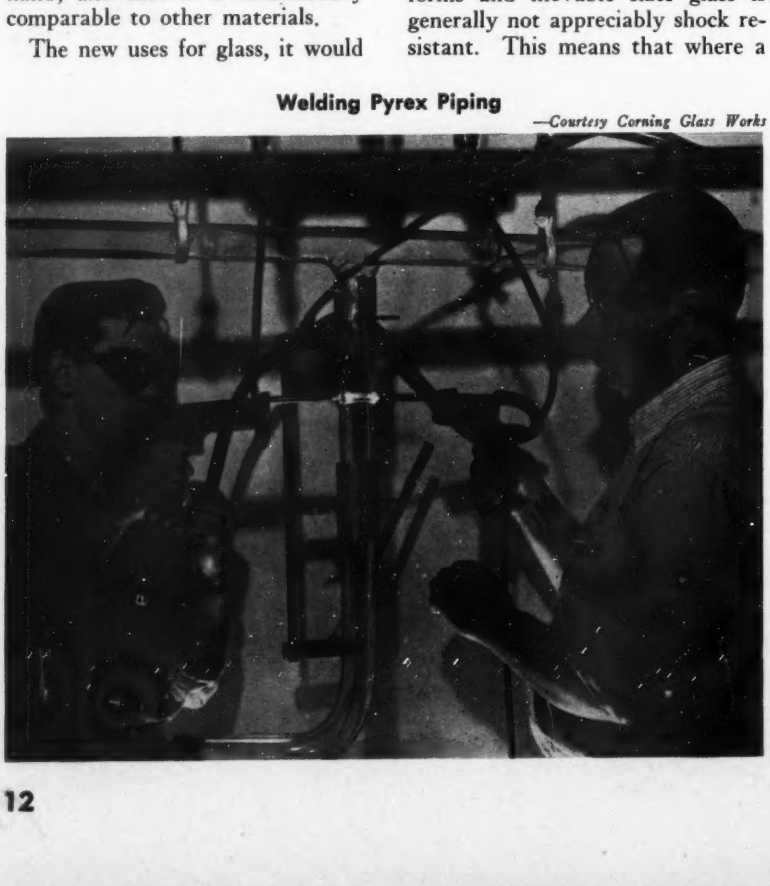
By DANIEL GLOSSER, EE '45

OUT of the vital need for increasing our supplies of special metals and alloys has come the introduction of many new uses for glass. Generally thought of as possessing the two outstanding properties of transparency and brittleness, glass actually can be made to have a far wider range of valuable characteristics. The argument for the increasing use of glass is strengthened, furthermore, by the considerations that its constituents are easily obtained and practically limitless in extent; that methods, equipment, and personnel for its manufacture are already at hand; and that it is economically comparable to other materials.

The new uses for glass, it would seem, divide themselves into two general fields. In the first category are those applications which, in the light of present knowledge, will prevail after our critical material shortages have passed. This means that glass must be a superior material with respect to a balanced consideration of the factors of cost, suitability, and durability. An example of such an application might be glass piping. Already well established in the chemical industry, this use is spreading into other fields. To the second category belong those uses which are of a substitute nature. In its usable forms and movable sizes glass is generally not appreciably shock resistant. This means that where a material must withstand an impact of high intensity, glass either can not be used or must be suitably protected. An example of the use of glass as a substitute material is in gauges of the snap type, usually made of a highly finished high grade steel. Whether permanent or temporary, however, the new uses of glass, involving brilliant research for superior qualities and ingenuity in fabrication, are all interesting.

Welding Pyrex Piping

—Courtesy Corning Glass Works



Thermal Shock Resistance

An ever increasing application is being made of those types of glass which are resistant to thermal shock. Glass with this property was first developed even before the last war. Its first use as piping was seventeen years ago. Many manufacturers, however, were wary of using glass for this purpose because of its brittleness. The general feeling was that it was a new innovation with no standardized methods of fabrication and no specialized labor for installation. It has been shown, however, that the advantages of glass piping in many instances outweigh its disadvantages. In the first place, glass is corrosion resistant to all acids except hydrofluoric. This property alone, in a process where acids are present, would be enough to make its use feasable. Indeed, it has been shown in practice that glass piping long outlasts metals in a system of transport for corrosive fluids. In the manufacture of foods, the governmnent sanitary regulations concerning the cleanliness of pipe lines required their frequent dismantling. Even with this costly practice, the

pipes and fittings frequently corroded to such an extent that they had to be replaced. A solution to this once troublesome problem has come with the introduction of glass piping, for with this material, corrosion can be forgotten and a thorough cleansing administered simply by flushing with hot water.

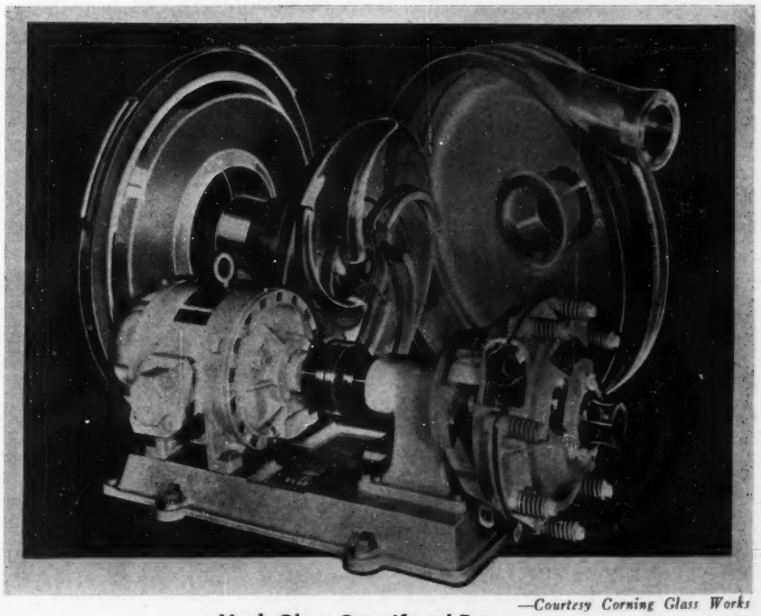
Glass Pipe Lines

The construction of glass pipe lines, however, is not without its own difficulties. Consider the problems of support and of joining. The first of these involves a consideration of the stresses in the pipe caused by the weight of the section plus the weight of the liquid in transport. While certain specimens have withstood as much as ten thousand pounds per square inch in tension, a safe working tensile stress for glass rarely exceeds three thousand pounds per square inch. Without going into detail, it might be said that when glass pipe is employed, the twenty or thirty foot spans used for metal piping are impossible.

Until recently, methods of joining glass to glass have almost all involved the use of some kind of a metal fitting with a rubber gasket. These systems have never been entirely satisfactory because of both the difficulty of making the joint and the possibility of leakage. The present shortage of metals has precipitated the development of a new method, welding. The welding of glass is similar to the welding of metal parts in that the material is raised to the fusing temperature for joining. The equipment for performing the operation is specialized, consisting of portable apparatus for generating a high frequency current and a means for producing a small hydrogen flame to convey the arc to the glass. The tube ends can be quickly welded together in place and subsequently annealed in short order.

Pumping Equipment

In order to utilize the sanitary and non-corrosive properties of glass piping to their fullest extent it was necessary to develop pumping equipment made of the same material. Although, the available pumps all utilize metal for reinforcement and power transmission, they are designed to prevent the fluid from coming in contact with anything but glass. The glass pump impeller is securely bonded to a metal shaft. Casing and back plate are strengthened by cast iron end pieces. Springs under the bolts, together with a design embodying good mechanical balance, prevent failure of the glass parts through repeated stress of vibration. As in metal pumps, the glass surfaces are finished to high dimensional tolerances for efficient operation, and, it is found that by virtue of the increased smoothness of the working faces, the frictional drag encountered is very slight.



—*Courtesy Corning Glass Works*

Nash Glass Centrifugal Pump

Most of these new uses have come as the happy result of one outstanding development. This was the discovery in 1914 by Sullivan and Taylor of the borosilicate glasses. Resembling quartz, the so-called perfect glass, this product combined the properties of thermal and corrosion resistance with the highly desirable characteristics of high strength and abrasion resistance. Unlike quartz, however, this material could be easily melted and formed into usable shapes. A summary of some of the valuable methods of employment of these shapes follows.

As an insulating material, much use of glass is being made in the electrical industry. In the field of power, glass pole insulators are widely used. Much rubber, a highly strategic item, is being saved by the substitution of woven glass wire insulation. For the new ultra high frequency radio parts, glass has proved to be a superior supporting agent. The loss factor, important at these frequencies, can be very closely predetermined and controlled by the employment of glass. The new possibilities for constructing intricate sections and accurate dimensions, moreover, make the use of the transparent material highly advantageous.

In England, windows shattered into flying splinters by even fairly distant bombing have been the cause of serious casualties in homes and work stoppages in important industries. A new development in the glass fiber field offers a solution to this problem. The new window-covering material combines black-out qualifications with blast-cushioning. In addition to this, the new material is an excellent fire-proofing agent and an excellent heat insulator.

The hardness and abrasion resistance of the borosilicate glass have already been mentioned. The textile industry is taking advantage of these properties by using glass for bars, rollers, thread-guides, and

(*Continued on page 26*)

OFFICERS OF THE

U. S. Navy Photo

Captain Chippendale

Captain Burton Whitham Chippendale, U.S.N.

EQUALLY at home upon a battleship, cruiser, destroyer, or submarine as upon his present station here at Cornell, Captain Burton Whitham Chippendale, U. S. N., Commander of the Naval Training Schools at this University, is an example of a versatile Naval officer. He has served on all of these types of ships as well as in many other capacities in his thirty two years of service in the Navy.

Having desired to join the Navy since he was a boy in North Adams, Massachusetts, he received an appointment to Annapolis in 1911, when he was sixteen years old, from the same congressman who appointed Colonel Van Deusen, the Commander of the Army Units at Cornell, to West Point. While he was at the Naval Academy he was a member of the track squad for three years. After graduation in 1915, he served on a battleship for a year and then on a survey ship based at the Panama Canal for another year.

When war was declared, however, he volunteered immediately for submarine duty and was sent to submarine training school. After he graduated from this, he participated in normal submarine patrols on the East Coast for the duration of the war and served on submarines until 1928. Though he served on submarines for eleven years, the longest time he spent with any one type of ship, his vessels never suffered from any out of the ordinary mishaps or accidents. Between 1921 and 1923 he took a post graduate course in Diesel Engineering at Annapolis and Columbia University.

In 1928, Lieutenant Commander Chippendale was transferred to the Battleship *U. S. S. Arkansas,* on which he served until 1930; then he was transferred to the Naval Research Laboratory in Washington, D. C., where he was Executive Officer for two and one-half years. In 1933 he was made Gunnery Officer of the *U. S. S. New Orleans.*

He was commissioned a Commander in 1936 and was given the command of the *U. S. S. Nokomis,* a survey ship, upon which he remained until he was transferred to the Naval Academy in 1937, where he was attached to the Seamanship department for three years.

When war broke out in Europe and rearmament began, he was transferred to San Diego, California, where the old destroyers, laid up

(*Continued on page* 22)

Lieutenant Commander Richard Wagner, U.S.N.

LIEUTENANT Commander Richard Wagner, U. S. Navy (Retired), is the Executive Officer of the Naval Training Schools, Cornell University. In this position, he is second in command of the Schools and is responsible for the organization and internal administration of the station; further, as Aide and Executive to the Commanding Officer, he is his direct representative for maintaining the military and general efficiency of the Schools. He reported for this duty at Cornell in July 1943 in continuation of his naval career, which began just twenty years before.

Commander Wagner was born in Cleveland, Ohio, and attended public schools until he entered Case School of Applied Science to further his mechanical engineering training. While at Case, he was active in fall and winter sports and became a member of Kappa Sigma Fraternity. He left Case in 1923 to enter the U. S. Naval Academy at Annapolis, from which he was an honor graduate of the Class of 1927.

Then followed a varied career which gave him a broad range of experiences. He completed post-graduate work at the Officers' Torpedo School and a short course in Aviation Indoctrination. In 1928, he was on temporary duty with the Electoral Commission in Nicaragua and, that same year, was the Boiler Division Officer of the *U. S. S. Wyoming.*

While on the cruise on the *U. S. S. Wyoming,* he participated in the rescue of the Lambert-Holt Liner, *S. S. Vestris,* when it shifted cargo during a gale off the Virginia Capes and sank with a loss of 212 persons. The *Wyoming,* at the time of receiving the SOS from the *Vestris,* was anchored in Hampton Roads and steamed at full speed to go to its assistance. After battling mountainous waves for 20 hours, the ship's searchlights enabled other vessels to pick up a few of the survivors, and, the following morning, the *Wyoming* picked up seven passengers who had been swimming in the icy waters for 20 hours. These included the wife of the Japanese Military Attache at Washington. As a reward for services on

(*Continued on page* 22)

Lt. Comm. Wagner

NAVY PROGRAM

Lieutenant Commander C. B. Reemelin, U.S.N.R.

THE posts of Officer in Charge of the V-12 Unit and of Insurance Officer at the Naval Training Schools at Cornell University under Captain Chippendale, U.S.N. are held by Lieutenant Commander Clarence B. Reemelin, U. S. N. R., an officer who, in both civilian and military life, has proved himself extremely versatile. Besides having held a commission as Lieutenant in the last World War, he has been a newspaperman, sales manager, real estate executive, and a bank official in civilian life, as well as having been connected with many other types of work.

Hailing from Cincinnati, Ohio, he received his education in that city. He attended St. Xavier's University, a Jesuit college in Cincinnati, from which he was graduated with his B. A. degree in 1908. From school he went directly into newspaper work, becoming connected with the Scripps-Howard chain through the "Cincinnati Post". He was first a reporter, and then was promoted to the post in charge of promotion of classified advertisements in the newspaper chain, this job taking him all over the country. He stayed with newspapers for seven years.

When the first World War was declared, Mr. Reemelin immediately joined the Naval Reserve Flying Corps as a 2nd Class Seaman, and was sent to the Massachusetts Institute of Technology for his ground training. After this was completed, he reported to Pensacola, Florida, where he was placed in ground administrative duty. While there he had an interesting experience; he was the first passenger the present Admiral Byrd ever took up in an airplane.

He was then transferred to the Bureau of Navigation in Washington, D. C., where he became the Aviation Aide to the Chief of Training in that Bureau. His duties at that station were those of the Materiel Officer, as he supervised the supply of equipment to the Naval Air Corps ground training schools. While there he worked with and

(*Continued on page 28*)

Lt. Comm. Reemelin

Captain William Joseph Dumas, U.S.M.C.

CAPTAIN William Joseph Dumas, acting under Captain Chippendale as the officer in charge of the Cornell V-12 Marine Detachment, is a newcomer to Cornell, having arrived just before the V-12 program started on July 1. Along with his duties in commanding the Marines, he also teaches a class in Naval Organization. According to the men in this class he is an excellent teacher who presents hard facts rather than useless words in putting over a point. He insists on discipline and does not specialize in funny stories; yet he is regarded by his students as an excellent officer.

Born and raised in New Rochelle, New York, he received his preparatory training in small sized Iona Prep, which covered both grammar and high school. During his final years at Iona, Captain Dumas participated in debating and spent a good deal of time pursuing this interest while along the athletic line he played football and several other sports. In 1935

U. S. Navy Photo

Captain Dumas

he graduated and entered Georgetown University of Washington, D. C. Since he was working toward a law degree, he entered the school of Arts and Sciences where he majored in English, history, and philosophy. During his college years he joined a debating club, and also became a member of the International Relations Club. He was initiated into Delta Epsilon, a local fraternity, and later became its president.

Captain Dumas was Exchange Editor of the *Hoya*, which is Georgetown University's newspaper. During this period he wrote the Exchange Column and the Record Column, in which the latest phonograph records were reviewed.

At Georgetown he also acted as manager of minor sports and later won his letter in golf. The golf team in his junior and senior years was especially successful. One year they won the Eastern Intercollegiate Golf Championship, and the following year they were runners-up to Princeton for the same honor.

In 1939 he graduated from Georgetown, entered Fordham Law School, and also worked part time in the insurance business. After a year at Fordham he left school to enter the insurance business as a full-time occupation. In October, 1940, he enlisted in the Marine Corps, and four months later he graduated with the First Candidate's Class at Quantico, Virginia. Then he spent three months at Reserve Officers Class, a month of line duty at Parris Island, and

(Continued on page 34)

CORNELL SOCIETY of ENGINEERS

107 EAST 48TH STREET NEW YORK 17, N. Y.

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501 East 44th St., Savannah, Ga.

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171—85th St., Brooklyn, N. Y.

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107 East 48th St., New York, N. Y.

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374 N. Fullerton Ave., Upper Montclair, N. J.

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816 Sumner Ave., Syracuse, N. Y.

GORDON J. MERTZ, *Vice-President*
540 Shoemaker Rd., Elkins Park, Pa.

A. MORTIMER ERSKINE, *Vice-President*
139 Watchung Ave., Chatham, N. J.

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Message

Fellow Cornellians:

Greetings! In addressing you for the first time as president of the Cornell Society of Engineers, I say to you that I am deeply conscious of the honor which you have bestowed upon me, and I shall work with untiring zeal to merit your confidence. I bespeak for the officers and various committees of the Society your encouragement and support with the hope that our achievements will be fully deserving.

To you valiant members of the services enjoying the privileges of instruction in our engineering colleges, I extend all good wishes for a happy and profitable sojourn at Cornell, and express the hope that you will always look back on this interlude in your lives with pleasure and satisfaction.

To you undergraduates pursuing your regular courses of instruction I express the hope that the war's end will come soon enough to enable you to continue without interruption.

In the name of the Society I salute the Dean of the College of Engineering and his administrative and instruction staffs who are carrying the 'round-the-calendar demands so ably and enthusiastically.

I am sure that when the records are set up Cornell engineers will be shown to have made vast contributions to the great war program of creating, designing, constructing, planning and operating war activities which have resulted in such a prodigious output of the required material.

The achievements of the colleges while in need of so much additional equipment for the shops and laboratories have been notable and outstanding. These recognized needs are of prime interest to the members of our Society.

As you know, the expansion of the machine tool industry, a prime requisite to the success of the war effort, has been on a scale of such magnitude and so far above peace time needs that the inevitable result after cessation of hostilities will be the demolition and scrapping of much of this production. Similarly, the output of laboratory apparatus and equipment has been far above peace time requirements and much of this will be scheduled for idleness and discard at the war's end.

It is a bold fact that our shops and laboratories need many new machine tools and items of equipment, and we must take advantage of the possible availability from war industries of all of such items as we may need to fill our present and future requirements.

Our Society is, therefore, initiating an undertaking in which every member can take part to secure for Cornell the needed items for completely equipping our shops and laboratories. Our plans are to have Dean Hollister furnish us lists with specifications of present and forecasted needs and through an appropriate committee contact will be made with our membership who will determine the location and after-war availability of specified items. As all such items are to be used for educational purposes in a recognized institution, their acquisition should normally be through gift. Manifestly their value is deductable from taxable income.

Dean Hollister, with whom I have fully discussed our program and who has approved it with enthusiasm, feels that we can render a service of inestimable value to our engineering colleges and to Cornell through a successful completion of this undertaking. He views the opportunity as a real challenge to our Society.

Dean Emeritus Kimball, who has been Chief of the Machine Tool Priorities Section of the War Production Board, has given me much valuable information, and regards this as a rare opportunity for our Society to do something specific.

Tel Berna, who is General Manager of the National Machine Tool Builders' Association and a trustee of the University, has already approached Dean Hollister on the subject. He warmly approves our undertaking and will serve on the committee. You will be kept informed of the progress of the overall undertaking through my messages in the CORNELL ENGINEER, though all of you will, I believe, be active in carrying out the program.

Cordially yours,
JAMES LYNAH '05

ALUMNI NEWS

Trans-Iranian R.R. Head

COLONEL Paul F. Yount, who attended the Cornell Civil Engineering school in 1932-33, is one of many people who have benefitted from their hobby in later life. Yount's interest was collecting model trains, and this avocation led him to his present position as head of the Trans-Iranian railroad, across which a major part of the Lend Lease supplies flows.

Yount attended West Point before coming to Cornell, where his passion for trains prompted him to collect extensive layouts. By the time he became an instructor at the Point, the "Yount Line" occupied the large basement in his house, and interested groups of young officers and cadets went to see his line in operation.

A new era of train life started when the family journeyed to Hawaii. At this time Yount sold his old collection of trains, as the new thing on the market was the scale model which required different kinds of track and other equipment, being real replicas of actual trains.

When the Hawaiian trip was nearing a close, the then Captain Yount heard of an opening for an officer to be assigned for a year as an observer to the Chicago, St. Paul, Minneapolis & Omaha Railroad. Asking the War Department to put his name on the list, he won the assignment and spent the year learning about real trains.

After his tenure on this job, he went to Washington as Acting Chief of the Railway Section in the Chief of Engineers office. After a stay at this position Yount was shifted to the 711th Engineer Railway Division and shortly thereafter was sent overseas.

As head of the Trans-Iranian Railroad, he holds a very important post. This road, which runs from Bandar-i-Shapur on the Persian Gulf to the Caspian Sea, was just recently completed. Before the Mediterranean fell to the Allies, the bulk of American supplies to the U.S.S.R. was shipped over this line to the Caspian, where boats carried them up to Russian ports. This railroad is doubtless playing a major part in the current campaigns.

Fred J. Wellhouse, E.E. '09

FRED J. Wellhouse, M. E. '09, has been named technical head of the light control division of the West Coast Dimout—a function of the Office of Civilian Defense. Among his duties will be the solution of the many complex problems attendant on the enforcement of dimout regulations.

Mr. Wellhouse was born in 1886 in Topeka, Kansas. He entered

—Courtesy Westinghouse

Fred J. Wellhouse

Cornell after attending high school in Topeka. While here, he was a member of the Sibley club, the student organization of the College of Engineering at that time, and upon graduation he joined the Westinghouse Electric and Manufacturing Company. He was switch gear specialist in Boston until 1917, when he was called for service in the first World War. Working on the development of hand grenades he rose to the rank of captain in the Ordnance Division. After the war he returned to the switchgear division of Westinghouse. In 1921 he was sent to the Pacific Coast as an application engineer in the power apparatus field. He was appointed in 1931 to the special work of handling aviation and street lighting. He is now "on loan" to the OCD.

Wellhouse is past chairman of the San Francisco section of the Illuminating Engineering Society, and is, at present, Vice-president of this organization for the Pacific coast region.

Alexander Kennedy, Jr., '07

ALEXANDER Kennedy, Jr., M.E. '07 has recently been appointed to the newly created position of assistant to the manager in charge of engineering of the General Electric's Federal and Marine division.

In 1908, Mr.Kennedy went from Cornell University into G.E.'s "test course", an apprentice course for new men, and has been identified with marine affairs since 1919. Previous to joining the marine department upon his return from World War I, he was associated with the induction motor department. For the past ten years he has been the application engineer on main propulsion turbines and gears which were designed for the new Navy combat vessels, which, because of their superior performance, have been termed by the Navy department as "one of America's secret war weapons." He has also helped develop propulsion and auxiliary equipment for the Merchant Marine, and is considered one of the foremost marine engineers in the country by prominent naval architects and shipbuilders.

Mr. Kennedy is a native of Pittsfield, Mass., a member of the A.I.E.E. and a member of the Society of Naval Architects and Marine Engineers, U.S.A. While at Cornell he played football during his Sophomore and Senior years.

Albert Kingsbury, M.E. '09

ALBERT Kingsbury, M. E. '89, founder and president of the Kingsbury Machine Works, died recently at his home in Greenwich, Con-

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NEWS OF THE COLLEGE

ESMWT

A summary of Engineering, Science and Management War Training activities for the past year, from July, 1942 to July, 1943, shows an enrollment from Ithaca and vicinity of 1298 students.

Thirty-one courses were given by 25 fulltime and 31 part-time instructors from the faculty of Cornell, which sponsors the training in cooperation with the U. S. Office of Education. In addition, there were four part-time instructors from industry or other institutions; a number of students represented industries in the city.

The summary for 16 upstate cities the past year, announced by Director Walter L. Conwell, shows an enrollment of 9096 students in 293 courses of study. The full-time staff totaled 32, and the part-time staff, from University, industry, or other institutions, 177. Approximately 400 companies were represented by students in these evening war-training courses. Cities served during this period were Auburn, Binghamton, Buffalo, Corning, Dansville, Elmira, Endicott, Hornell, Ithaca, Jamestown, Wellsville, Lockport, Niagara Falls, Olean, Penn Yan, and Salamanca.

Electrical Research

A better understanding of electrical phenomena, which have been observed experimentally since Steinmetz' time, is the basis of research and new results achieved by Dr. M. G. Malti, Associate Professor of Electrical Engineering at Cornell, and his research associate Dr. M. Golomb. The nature of the research is an investigation of temporary or transient conditions occurring in power transmission and telephone lines.

Serious interruption of service is frequently the result of switching operations and high voltage surges resulting from lightning. A few years ago in New York City, for instance, a lightning surge crippled an entire section of the city by stopping the transmission of electrical power. The cause of much of this trouble with the safe handling of electrical transients is the inadequate knowledge of the magnitudes of the quantities involved. To provide a usable and dependable mathematical treatment of transient conditions has been the purpose of Dr. Malti and Dr. Golomb.

Their results are published for

M. G. Malti

the first time in the form of two papers in the *Franklin Institute Journal* under the title "Electric Propagation on Long Lines Terminated by Lumped Network." These papers carry further the work begun by the late Michael Pupin and extended by John R. Carson of the Bell Telephone Laboratories.

Delta Club

At the beginning of the current term, the following were initiated into the Delta Club, Electrical Engineering social society:

Jose del Palacio
Bob Garmezy
Nick Markason
Bob Seldon
Shay Sheheen
Bob Trousdale
Carlton Whitman

The group expects to hold a club banquet before the end of the term.

Tau Beta Pi

THE following men were elected to Tau Beta Pi, honorary engineering society, on September 27.

Robert Barrington Benscoter, CE '44, V-12
Carl Robert Blanche, CE '44, V-12
Edward Horace Carman, ME '44, V-12
Joseph Franklin Davis, ME '45
Richard Gordon Milhan, CE '44
John Lee Olsen, Chem E '44
Jose del Palacio, EE '44
Howard Ashley Parker, Jr. Chem E '44
Resat Saribas, ME '43
James Mark Scovic, Chem E '44
James Stooker, Chem E '44
Moody Chalmers Thompson, Jr., EE '44

In a special election held to fill a vacancy, Milton Stolaroff, EE '44, was elected recording secretary.

Chi Epsilon

CHI Epsilon, civil engineering honor fraternity, will meet this month to elect new officers for the fall term. Carl Blanche, president, and Robert Benscoter, vice-president, are at the present time members of the Navy V-12 program. The other officers elected for this term are Richard Milhan, recording secretary, and Adrien Duncan, corresponding secretary.

The following were initiated into Chi Epsilon at their initiation banquet at the Asiatic Gardens on Friday, August 27:

Cushing Phillips, Jr., '44
David Earl Carter, '45
Charles Kenneth Kerby, Jr., '45
Donald Roderick Smith, '45
George Earl Williams, '45
William Zuk, '45

The program of this honor fraternity is to support improvements in engineering education and to recognize and honor scholastic achievements. One of the most coveted prizes in the C. E. school is the Chi Epsilon Freshman cup, awarded to the freshman with the highest average in his class.

(*Continued on page* 30)

"Loose Juice"

Collected by Bob Garmezy

The Lay of the Last Civilians

or

Never Let An EE Near A Juke Box

Oh, I came up to old Cornell,
thought I'd have some fun;
Till I joined the EE school, now
I'm on the run.

Oh, lay that sliderule down, boy,
Lay that sliderule down,
Slip stick slipping sucker,
Lay that sliderule down.

We started out in Franklin Hall,
first year it was fun,
We thought the freshman work
was tough but the worst was
yet to come.

Oh, put that answer down, boy,
Put that answer down,
Much too late to change it now,
Put that answer down.

We said next fall we would in-
dulge, in women, wine and song,
Till the 410 special came our way,
engineered by E. M. Strong.

Oh, lay that handbook down,
boy,
Lay that handbook down,
Here's your hat, and there's the
door,
Lay that handbook down.

As Juniors we thought it was time,
to mix our work with play,
But Mech. Lab. changed our mind
right quick, and up all night
we'd stay.

Oh, lay that test-piece down,
boy,
Lay that test-piece down.
Get it from an old report,
Lay that test-piece down.

Our Senior year has come at last,
these days are almost done,
We'll soon be out of old Cornell,
and then we'll have some fun.

Oh, lay that sliderule down, boy,
Lay that sliderule down,
Let's go out and have a beer,
Lay that sliderule down.

On this page we are resuming a feature which proved popular last year. Although originated by the Electrical Engineers, LOOSE JUICE *welcomes all humorous bits from the other schools.*

There's just one thing that we for-
got, there's still no time to play,
We're in a war which must be
won; we'll soon be on our way.

Oh, lay that 2A down, boy,
Lay that 2A down,
"Greetings from the President,"
Lay that 2A down!

By Milt Stolaroff
and Bud Thompson

DAFFYNITIONS

Commutating Poles are those immigrants from Warsaw who go to work in New York and live in Jersey.

Breakdown Torque is the conversation of a prisoner at the end of a successful 3rd degree.

Polyphase Induction Motor is a two faced motor whose performance doesn't agree with your calculations; e.g. Motor #44640 in Rand Hall.

Glow Discharge—the results of n—1 beers.

Arc Back—the results of n+1 beers.

Push-pull Stage—Barton Hall with Benny Goodman.

Grid Control—what Carl Snavely has at Schoellkopf.

Grid Bias—what the referee has when he calls a holding penalty on the home team.

Crookes Dark Space—a gangster hideout.

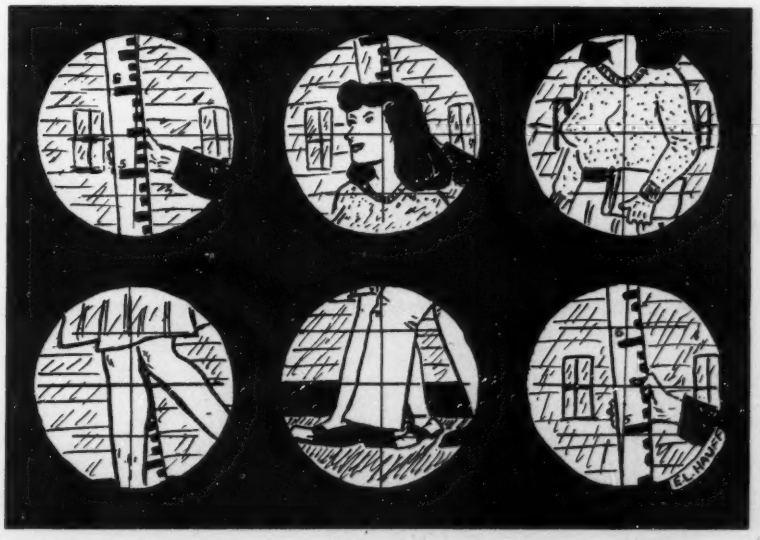
We hear from reliable sources that now that the pleasure driving ban is lifted, Paul Ankrum walks to Franklin to save gasoline.

Interesting Fact—Engineering Principles in Electrical Experiments was copyrighted in 1939 by Prof. Burckmyer and has been copied wrong by every senior EE thereafter.

And then there was the CE with a bandage on his head—a thought struck him.

In an Eta Kappa Nu meeting, when it was being debated how to prevent absenteeism at initiation, someone suggested putting teeth into the resolution with a $2 fine. Tony Prasil came out with, "Yes, two buck teeth."

Coincidence—the length of a woman's waist and an engineer's arm are about the same.



Bigger Round-upor

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A-C equipment helps speed meat through packing plants—helps dehydrate foods so each ship can carry 10 times more.

How Allis-Chalmers, one of U. S. A.'s most unusual companies, prod Tractors and Farm Machinery . . . Generators, Turbines, Drives for Plants . . . 1600 products to help Feed the World and Lick the Axis.

FEW OF OUR WORKERS have seen a Texas or an "Axis" round-up . . . yet they *are* helping to put beef on soldiers' plates, prisoners in Allied stockades.

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—Tractors, corn pickers, harvesters . . . equipment for dehydrating and processing foods . . . crushers for mi switchgear for steel mills; motor war plants . . . even hull sections for

And A-C engineers—in factories over America—are helping to inc production, not just with new mac —*but with machines already on hand.*

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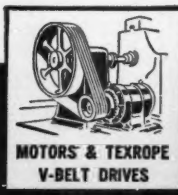
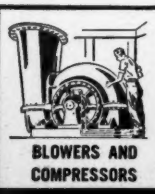
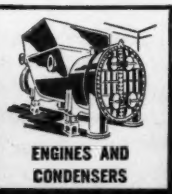


MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS



ENGINES AND CONDENSERS

CENTRIFUGA PUMPS

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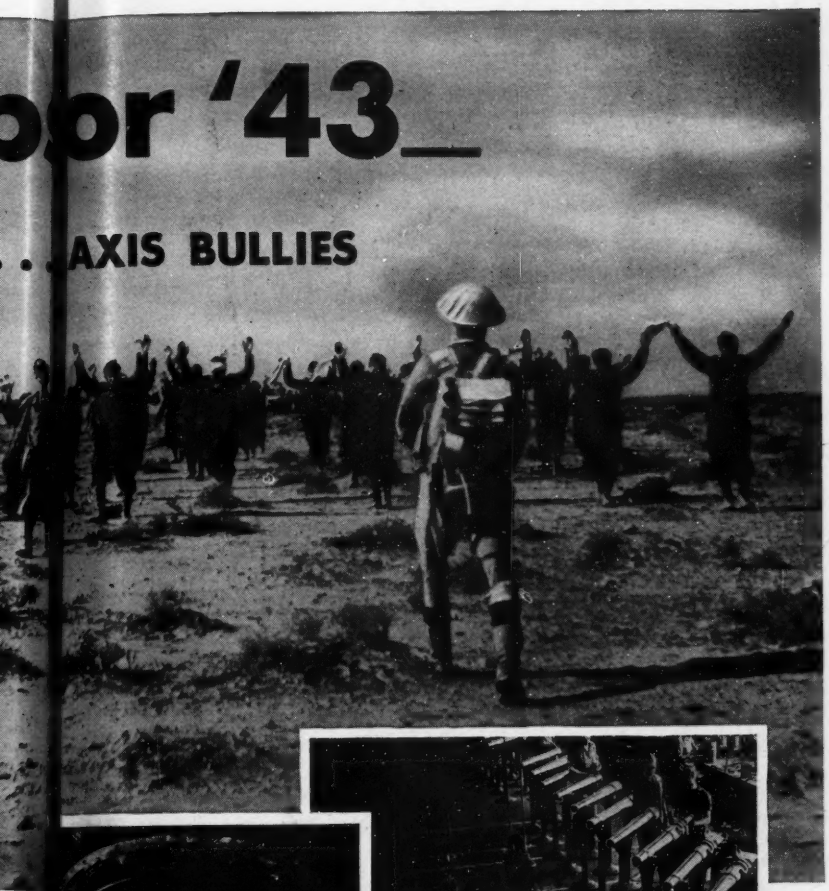
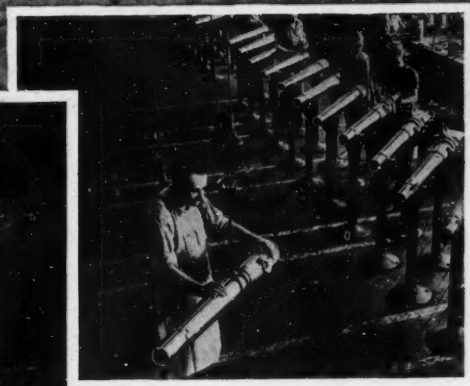
SUPPLYING THE WORLD'S LARGEST LI MAJ

...or '43_

...AXIS BULLIES





(above) **A-C equipment** — motors, belts, drives—keeps all types of guns moving along U. S. production lines.

(left) **Huge A-C crushers** like this one munch iron ore, and other A-C equipment helps turn it into steel.

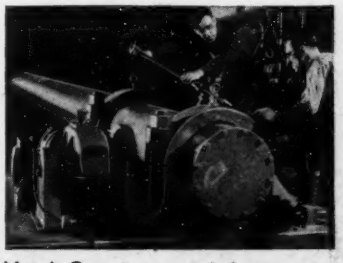
VICTORY NEWS

A-C Launches Farm Commando Plan: A large share of America's farm equipment will soon be brought to peak efficiency through Allis-Chalmers' new "Farm Commando" program.

Two-day mechanic schools are being conducted by Allis-Chalmers men in many agricultural sections.

Designed to give untrained men basic maintenance "know-how," they also serve as "brush-up" schools for skilled mechanics.

Following this, the farmer receives detailed, specialized instruction on his own equipment. Special red-white-and-blue emblems are provided for his machines to announce that each of them is a "Farm Commando, Ready to Roll..."



Not A Gun, but an Axis buster nevertheless! This huge tool is used in A-C shops to bore out the inside of kilns. It helps increase production of manganese.

British Ask For A-C Booklet: A sign that British industry currently cocks an eye at vital maintenance, comes in the form of a request from a representative of the Electrical Advisory Panel. To "tell all" about motor care in wartime, our Allies will pattern their information after Allis-Chalmers' "Guide to Wartime Care of Electric Motors." This booklet has already been widely distributed in the U.S.A. *Write for your free copy today.*

FOR VICTORY

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WE WORK FOR VICTORY — WE PLAN FOR PEACE

Commander Wagner

(*Continued from page* 14)

the *Wyoming,* Commander Wagner received a letter of commendation when the ship was presented with the Navy E for winning the Engineering Efficiency Competition.

Later, on the same ship, Commander Wagner served as the Assistant Communications Officer on the staff of Vice Admiral W. C. Cole, who was serving as the Commander of the Scouting Force. Following that, the Commander served in destroyers and on two of the new heavy cruisers, experiencing some of the revolutions of Central and South America.

While attached to the *Louisville,* he took part in his second rescue at sea when the S. S. *Harvard* ran on the rocks off the coast of California. On this occasion the rescue ship had better luck, bringing off all hands and even the pets and baggage without a soul getting his feet wet. The *Harvard* then cracked in two and, sliding off a ledge, disappeared.

Shortly after this experience, Commander Wagner was ordered to the staff of Vice Admiral William H. Standley, the recent ambassador to Russia, who, at that time, was in command of the Cruisers of the U. S. Fleet.

Later, while serving as the Chief Engineer of the Destroyer *Hopkins,* Commander Wagner met with a serious automobile accident in San Diego and was placed on the Retired List.

He was recalled to active duty in 1940 as one of the original officers to organize the U. S. Naval Reserve Midshipmen's School at New York. At this time the plan was very nebulous, and it was necessary to convert the old *U. S. S. Hill* into a barracks and classroom building, to devise a curriculum for training Deck and Engineering Officers, and to assemble the vast amount of material and equipment necessary for conducting such a school. The original class reported with an enrollment of 299. This was rapidly increased until the Midshipmen's School had taken over the New York Central Freight House, several warehouses, most of the dormitories of Columbia University, and a large portion of its classrooms to accommodate a total of 2900 Midshipmen every four months. In the meantime, the Midshipmen's School sponsored an indoctrination class for officer instructors and a class for military governors and set up a course in which most of the officers now engaged in the Navy V-12 Program were indoctrinated.

When this expansion was nearing its end, Commander Wagner was detached from the Midshipmen's School in New York and sent to the University of Notre Dame to organize a new Naval Reserve Midshipmen's School in South Bend. After a year of duty as the Executive Officer of that school, he was transferred to Cornell.

Captain Chippendale

(*Continued from page* 14)

since the end of the last war, were being refitted and recommissioned. Some of these later became the "lend-lease" destroyers. When this had been completed, he received the command of a division of the old destroyers, which he kept until July, 1940. At this time he was

(*Continued on page* 24)

HIGGINS AMERICAN DRAWING INKS

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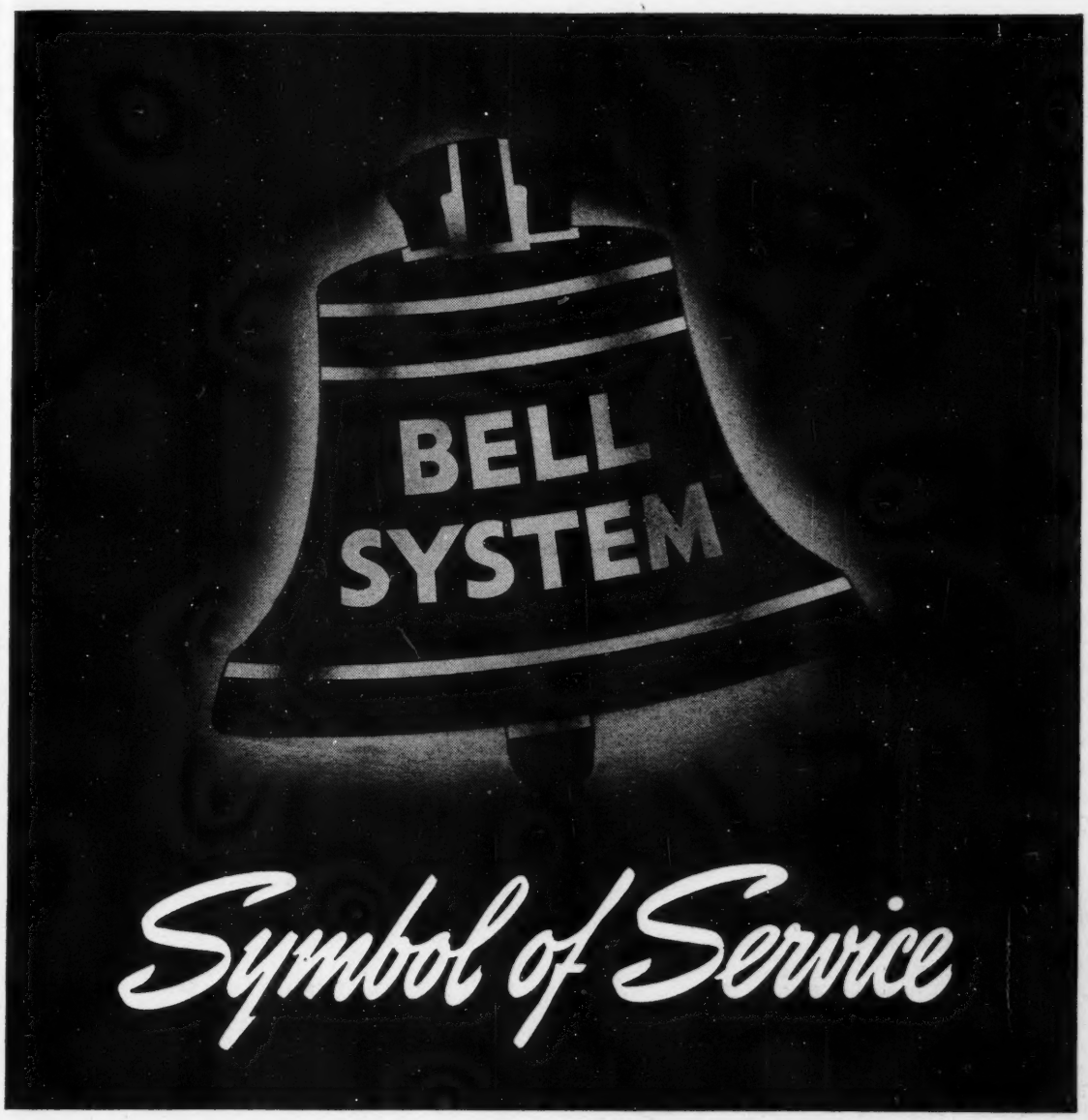

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5. Western Electric Co. is the manufacturing, purchasing and distributing unit.

The benefits of the nation-wide service provided by these companies are never so clear as in time of war.

★ ★ ★ ★ ★ ★

Captain Chippendale

(*Continued from page* 22)

transferred to the command of a division of brand new destroyers assigned to the Atlantic Fleet on Neutrality Patrol in the Atlantic and in the Caribbean.

Prior to the United States' entering the present World War he was appointed Commanding Officer of an auxiliary ship, and information about this phase of his service is restricted for security reasons beyond the fact that he received his temporary commission as a Captain on January 1, 1942, this being made permanent the following March. He was transferred to Cornell University to be Commander of the Naval Training School at this station in June, 1942.

Captain Chippendale is known here as a strict, rigid disciplinarian who, however, possesses a marked sense of humor. He likes to command what is known in the Navy as a "tight" ship. He is a man who is willing to give assistance, or punishment, or play a game of golf on the Country Club links at a moment's notice. He is married, and Mrs. Chippendale lives here in Ithaca with him. At home one of his greatest interests is in his dog, "Skipper", whose only apparent failing appears to be his enjoying going to school with the neighboring children, (a trait unusually characteristic of all the dogs of Ithaca).

Having served a total of sixteen years at sea, Captain Chippendale has won in that time the World War Campaign Badge, the Defense Medal, and the American Theater Medal, the latter two being obtained in this war.

Before coming here he had had no previous contact with Cornell, even in regard to his sports activities while at Annapolis. Thus, when he arrived, it was his first glimpse of the Hill; and he liked it. While he has been here, he has received excellent cooperation from the civilian personnel of the university in the various phases of instruction going on at Cornell, including the Diesel Engineering School, the Communications School (since transferred), the General Service School, and the V-12 program.

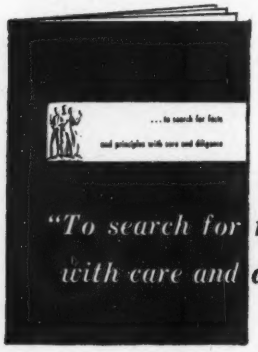
Captain Dumas

(*Continued from page* 15)

three months of sea maneuvers. In April, 1942, he went to the West Coast, then to New Zealand, and on the seventh of August commanded a company of Marines in the first landings on Guadalcanal. In October his battalion received a unit citation for the opposition they gave a Jap armored force in the battle of Matanikau River; they had destroyed twelve enemy medium tanks. The following month they fought in the battle of Upper Tanerau River as well as several minor skirmishes. About Christmas time Captain Dumas left Guadacanal for Australia. From there he was ordered back in February to the United States, where he was assigned to the fourth Marine Division at New River, North Carolina. Then, last June, he was assigned to Cornell.

After so much action in so brief an interval, Captain Dumas is once again finding time to brush up in his golf game at the Ithaca Country Club. Lately, he has also

(*Continued on page* 32)



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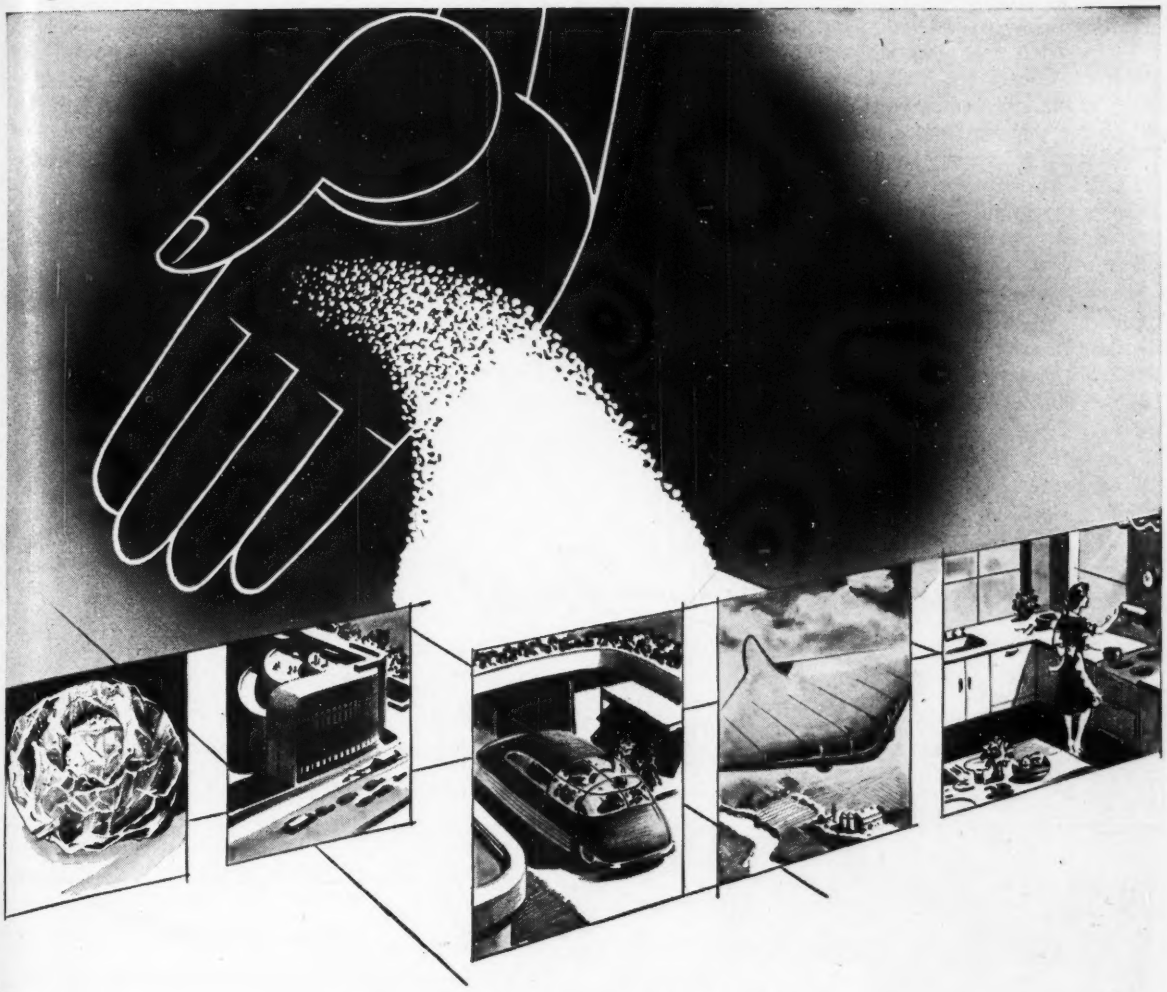

PLASTICS—products of industrial initiative

Plastics are a stimulating source of inspiration for architects and industrial designers in search of new ideas. When these intriguing materials are released from their military commitments, innumerable applications for the home front will arise. No products offer a better example of how progress can be accomplished when industry is given free rein to its initiative.

As a producer of basic chemicals needed for the manufacture of plastics, Dow is in a particularly fortunate position to promote their development. Three major Dow plastics—Styron, Ethocel and Saran—have already been produced. They possess distinctive properties that permit a bewildering array of uses in almost every field of human activity. There are also varieties of Dow plastic materials for coatings, finishes and other purposes in the electrical, textile and many other industries.

These plastic products do more than supplant other materials. They are veritable points of departure that lead to fresh fields. When normal conditions return, self-reliant industry, expanding on its own resources, will develop and apply them for the greater well-being of all America.

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CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

A Future for Glass

(*Continued from page* 13)

spindles. One of the little known facts about the employment of glass for mechanical parts such as in the textile industry is that it can be finished to very high tolerances, some ground finished parts in regular production having tolerances as close as two ten-thousandths of an inch.

An extremely important use of one new form of glass is as a low and high temperature insulator. The new product is cellulated glass called by its makers, "Foamglass". Since cork in the cold insulating field and asbestos in the heat insulating category are scarce, the employment of "Foamglass" is helping to make up the deficiency.

Almost all electrical measuring instruments contain many tiny jewel bearings. These jewels have been used because they were the only type of material capable of withstanding the tremendous pressures and abrasions of the tiny steel pivots. As a sufficient quantity of these jewels are not now available, glass parts are being substituted.

Aside from the above new uses of glass which have already been put into practice and proved successful, there are several applications proposed and tested only in the laboratory. One of these proposals may prove to be a prime factor in improving the performance of our aircraft. It is believed that one of the important reasons for the limiting of the performance of the airfoil is turbulence which occurs between the thin layer of air immediately adjacent to the wing surface and the outer air. It has been found that by covering the wing surfaces with fine glass fibres an airfoil surface can be created which will avoid turbulence at speeds above six tenths of the velocity of sound. The fibres are inserted so that they extend about one eighth inch above the surface of the wing and stand upright when the plane is standing still. When the plane is in motion, the fibres deflect to an angle of about forty-five degrees. The effect is to reduce skin friction which is assumed to be the cause of turbulence. The same treatment of propellors might increase their efficiency.

Limitless Possibilities

These examples, of course, are only a part of the many varied uses to which glass is being put. They show, nevertheless, that this material offers almost limitless possibilities of application. Glass has, by virtue of the complete investigation of the improvement of its properties, outgrown its windowpane and tumbler days. Glass is strong; it is replacing structural parts formerly made of metal. Glass is workable; it can be fabricated into an infinite number of complicated shapes and designs. Glass is abrasion resisting; it is being used in place of scarce tool steels. Glass is relatively inexpensive and its raw materials plentiful. With its already familiar property of transparency and with the amazing developments in its corrosion resistance, strength, hardness, thermal shock resistance, and ability to be formed accurately, glass promises to become increasingly useful toward winning the war.

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What we folks at home are trying to do about postwar may seem sometimes remote and obscure. You haven't had much chance to get acquainted with peacetime industry, and to see it in its true role as a creative job-maker.

Take our own business, Alcoa Aluminum.

You know about the tremendous expansion in aluminum capacity. You see most of this seven-fold production going into the planes you are going to fly, the planes that will be your cover on the attack.

But Aluminum's true role is no more military than yours is. Both of us do have an immediate job to do; and then, the future—

Ever stop to think how many things in this old world are crying to be made lighter? Or how many ingenious, imaginative young men are going to be needed to apply and sell and manufacture the more than two billion pounds of aluminum that will be available every year when this thing is over?

Actually, we see the possibility of a million jobs, doing something with aluminum in peacetime, a million new jobs that did not exist before this war. There are grand careers ahead in aluminum!

We are devoting our eighth day of thinking time to doing what we can to make those careers as certain as anything can be. We call it Imagineering: letting the imagination search the realm of new products and new applications, and then engineering the dreams, the hunches, the markets, into clear paths to follow, someday.

Perhaps one of those paths will be yours to follow in the future.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

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Commander Reemelin

(*Continued from page* 15)

under Dr. Charles E. Lucke, Dean of the engineering faculty at Columbia University at that time, who handled the curricula of studies for these schools. On June 1, 1919, he was ordered to inactive duty as a Lieutenant, senior grade.

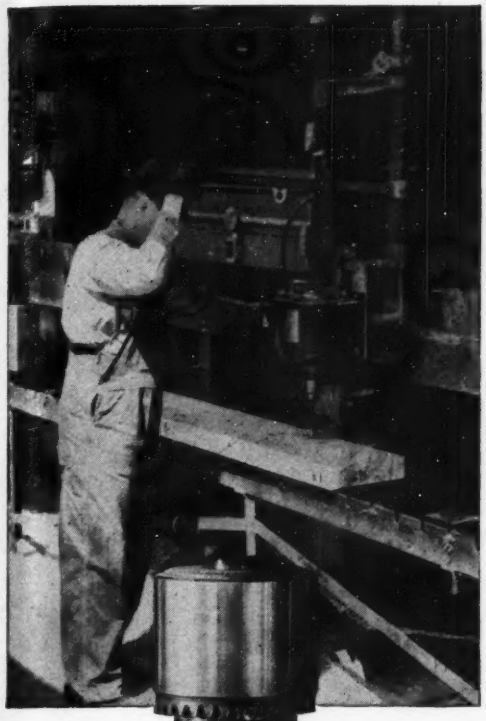
Lieutenant Reemelin then became a salesman with the National City Company on Wall Street, New York City, and with other companies which dealt in investments. From New York he went to Miami, Florida, where he went into the real estate business at Coral Gables, a town in that state. He became Vice President of the Bank of Coral Gables, and was responsible for the construction of the first motion picture theater in Coral Gables.

When the present World War commenced, Lieutenant Reemelin volunteered his services and was sent to Cornell as Liaison Officer in Officer Procurement work. Because of this fact, he is probably the best known Naval Officer on the Hill, as he has had so much contact with the civilian personnel and the student body of the University. He was ordered for a short time to the Bureau of Personnel in Washington, D. C., on temporary duty, and then travelled over the United States with one of the V-12 Contract Negotiating Parties. Then he was transferred back to Ithaca, where he assumed his present duties. It was while he was on this station that he was promoted to the rank of Lieutenant Commander, on August 15, 1943.

Commander Reemelin is exceptionally sociable and gregarious, being well known because he enjoys story telling and public speaking. During his career he has joined many organizations, becoming an officer in many of them. For instance, he is a member and Past Commander of Post 98 of the American Legion at Coral Gables, Florida; is a member of La Societe des 40 Hommes et 8 Chevaux, Miami Voiture 492; and is a Past Grand Knight of the Miami Council 1726 of the Knights of Columbus. Here in Ithaca he is a member of the Savage Club, The Elks, The Newman Club, and also a member of Hose 2, the volunteer fire department, one of the oldest organizations of its type now in existence. It is thus easy to see that he has become well known in circles outside of the University.

Sports and outside activities are one of Commander Reemelin's methods of relaxing from the Navy routine, and he enjoys golfing, horseback riding, fishing, hunting, and swimming among many other things. He likes to fly and does so whenever the possibility presents itself; this interest is held over from his experience in the Naval Air Corps in the last war. He likes dogs and horses, but has no pets of his own.

Before he came here, Commander Reemelin had had no previous contact with Cornell. However, he likes the University very much, saying that though he has been all over the United States he has never come into contact with a finer class of people in both the University and the Community, and has received excellent cooperation from them. He can't say as much for our weather, though.



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News Of The College

(*Continued from page* 18)

Eta Kappa Nu

ETA Kappa Nu, electrical engineering honor society, has elected to membership the following men, all of the class of '45:

Daniel Glosser
Thornton Stuart Lauber
Ernest Joachim Sternglass
Lawrence Allin Weber, V-12

The initiation banquet, which was for graduate, faculty, and undergraduate members, was held on Thursday, October 7. The guest speaker was Professor Vladimir Kazakevich, who has been teaching Soviet Economics in connection with the Russian Civilization Program this summer, and is now instructing Army Area and Language students in Russian geography.

The following students were elected to the E. E. Student Committee on Academic Conduct by their classmates: Seniors: Joseph C. Logue and Moody C. Thompson, Jr. Junior: Lawrence Weber, V-12. Sophomore representatives will be elected next term. The election was sponsored by Eta Kappa Nu.

Director W. A. Lewis

A.I.E.E.

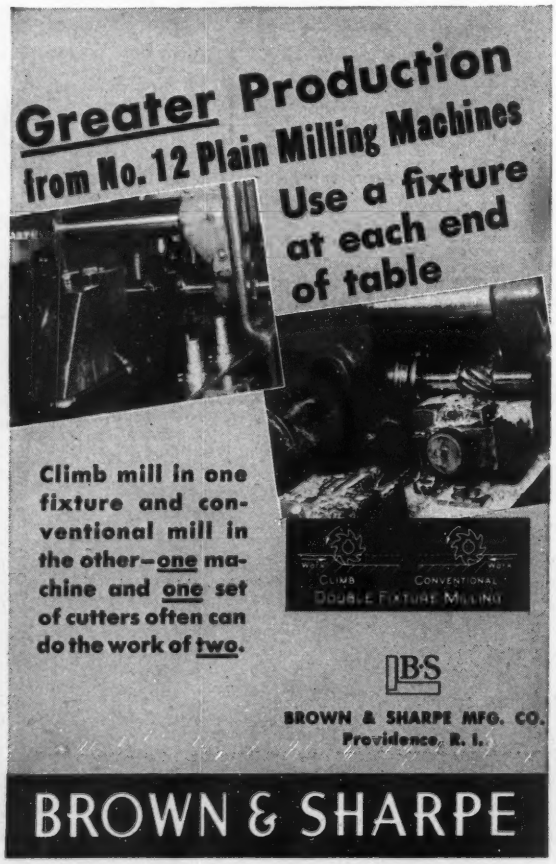
THE Cornell student chapter of the A. I. E. E. held its first meeting of the term in Franklin Hall on Sept. 2. The evening's program featured a showing of the motion picture "Lightning and Lightning Protection."

The chapter has opened a new membership drive to interest underclassmen, civilians and servicemen, as well as those who were previously members of the A. I. E. E. in other colleges and universities. Mimeographed forms, designed to encourage membership in the chapter as well as to stimulate interest in other Electrical Engineering groups on campus have been distributed among the Navy students and civilian freshmen.

Four weeks later, on September 30, there was much gaiety and song at Franklin Hall when the E. E. students showed their lighter side at another summer meeting of the A. I. E. E.

The affair opened with a talk by Director Lewis of the School of Electrical Engineering, in which the question "Why be an E. E.?" was reviewed. He told of the opportunities offered by the electrical engineering profession. There are four general fields open to the electrical engineer, those of power,

(*Continued on page* 32)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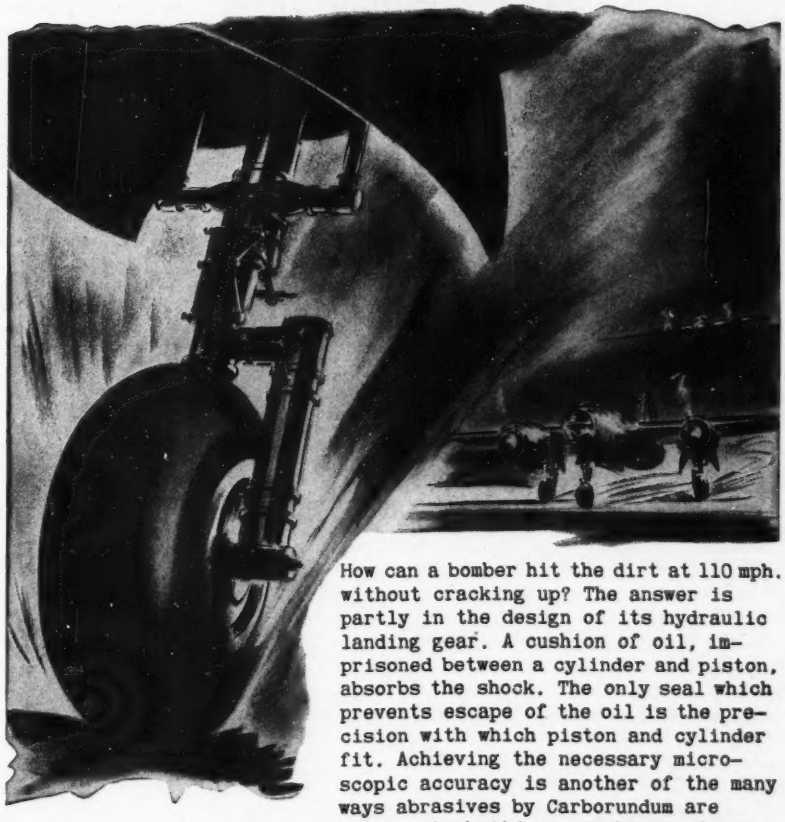
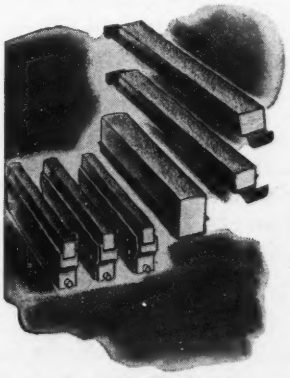
Landing at 110 mph. on a cushion of oil...



How can a bomber hit the dirt at 110 mph. without cracking up? The answer is partly in the design of its hydraulic landing gear. A cushion of oil, imprisoned between a cylinder and piston, absorbs the shock. The only seal which prevents escape of the oil is the precision with which piston and cylinder fit. Achieving the necessary microscopic accuracy is another of the many ways abrasives by Carborundum are helping to build our machines of war.

The interior surface of the landing gear cylinder is finished with a honing machine, as illustrated, fitted with abrasive sticks made by Carborundum. Similar honing machines are helping to produce engine cylinders, bearing races, and thousands of other products requiring an accurately finished internal cylindrical surface.



The future holds many possibilities for new uses of abrasives. When you take your place in industry, keep Carborundum in mind. The Carborundum Company, Niagara Falls, N. Y.

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"Where Service is a Habit"

A.I.E.E.

(*Continued from page* 30)

communications, applied electronics and illumination, but the danger of too much specialization in one branch should also be considered. Jobs will always exist for good men, said Director Lewis, but an engineer will generally be better qualified for a position if he has broad knowledge of several fields rather than specialized knowledge in only one.

After the lecture two films, "The Kilowatt Trail" and "Magic vs. Science", were shown.

The formal part of the meeting ended, the group accepted an invitation to refreshments provided by Eta Kappa Nu and the Delta Club. Singing started spontaneously and continued uninterrupted for the rest of the evening. A new song, "The Lay of the Last Civilian" (see page 19), was introduced and was very popular. At 10:30 the servicemen had to leave, but the civilians carried the proceedings far into the night.

The present officers of the student branch are: Robert H. Garmezy, chairman; Anthony J. Prasil, vice-chairman; Richard C. Koch, secretary-treasurer; and Prof. Eric T. B. Gross, faculty counselor.

Photo-grammetry

PROFESSOR P. H. Underwood of the School of Civil Engineering spent three days at a seminar in photo-grammetry at Michigan State College, East Lansing. Photo-grammetry, dealing with the making of maps from photographs, was taught by Prof. Underwood to a small group of students last term in connection with a course in surveying. The meeting, attended by representatives of 125 engineering colleges, was designed to instruct those who might be called on to give similar instruction to Army students.

Publications

TWO members of the civil engineering staff at Cornell are authors of articles appearing in two trade and professional publications.

In the August issue of *Water Works and Sewerage,* Assistant Professor H. M. Gifft has a paper entitled "The Mathematics of B. O. D. Determinations."

In the July issue of *Sewage Works Journal,* Conrad P. Straub, Ph.D. '42, has a paper on "Digestive Studies of Pure Vegetables." This work was done at Cornell in the sanitary engineering department and forms part of a great amount of experimental work commenced in 1934.

In the June issue of the 1943 *Proceedings* of the American Society of Civil Engineers, Assistant Professor George Winter discussed "The Strength of Slender Beams."

Professor Malcolm

PROFESSOR W. L. Malcolm, Director of the School of Civil Engineering, addressed the summer meeting of the student chapter of the American Society of Civil Engineers in Lincoln Hall on the training of pilots for the Royal Canadian Air Force, Tuesday, September 14. At that meeting eleven

(*Continued on page* 34)

The Men of America Wanted Something Simpler

Husbands fought with their backs to the wall—and lost—when leisure-loving Paris introduced its newest fashions to delighted women at the turn of the century. One busy American did something about it. He invented the zipper.

Whether in dress or Diesels, the lasting American preference always has been for simplicity of design. There you have one of the explanations for the success of Busch-Sulzer engines. A casual glance suggests their lack of complications . . . a thorough check-up proves it.

An important contributing factor to the long life and economy of Busch-Sulzer Diesels in the larger two-cycle types is the use of the trunk piston principle, called impractical by some but proved by more than a dozen years of successful operations. Whether your need is a marine or stationary Diesel, Busch-Sulzer can offer you the ultimate in performance.

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Professor Malcolm

(Continued from page 32)

freshmen joined the society, and plans were made for a minimum of three meetings during the fall term. As Melvin Garritt, the president of the Cornell chapter of the ASCE is now in the ERC stationed at another school, Adrian Duncan, the vice-president, is serving as acting president. Richard Milhan is the secretary-treasurer.

A.I.Chem.E.

The A. I. Chem. E. held a beer party Friday night, September 17, in the kitchen at Olin Hall. Several committees were appointed to nominate candidates for officers for next term. At the next meeting, which is to be held in a few weeks, elections will take place. Although A. I. Chem. E. has not been very active this term, they plan on having a fuller program for next term.

The present officers are: president, Louis Davis; vice-president, Bert Ely; and secretary, Harold Wood.

Dr. Rhodes

Dr. F. H. Rhodes, director of the School of Chemical Engineering, discussed the various construction details of home food freezer equipment at a meeting of nationally known refrigerator manufacturers here during the summer. The meeting was sponsored by the Food Processing and Research Council of Cornell as a part of its project of determining the most advanced and the most scientific methods of food preservation. Dr. Rhodes, speaking for the Chemical Engineering School, which is one of the five departments of the University participating in this project, presented to the group the mechanical requirements of home freezers, the insulation necessary for efficient operation, and the proper sealing of doors and lids. He also reported briefly on several makes of home freezers now in operation in the Chemical Engineering laboratories.

Rod and Bob

The following were elected officers of Rod and Bob, Civil Engineering social fraternity, this summer: James Whitney, '43, Chief Engineer; Cushing Phillips, Jr., '44, Recorder; and Charles Kerby, '45, Treasurer.

Retort and Beaker

Because of unsettled conditions and the drafting of a large number of members, Retort and Beaker has been inactive during the summer term. However, they expect to hold a meeting either the end of this term or the beginning of next term to work on pledging new members so that the society can function again next term. The present officers are: president, Firth Perryman; vice-president, Ed Walko; secretary, Howard Parker; treasurer, Frank Rivero.

Captain Dumas

(Continued from page 24)

been able to see his three brothers, one of whom joined the Navy, one the Army, and the third the Merchant Marine. Mrs. Dumas was a recent resident of Ithaca; but she has returned to her home, and it is rumored that Captain and Mrs. Dumas are awaiting the arrival of a new Marine recruit.

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of '46, '47, '48

Did you know an opportunity exists for you for part-time employment and participation in a successful student-owned and operated business now in its 50th year?

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CABLE sheaves for mining, drilling, and hoisting equipment are subjected to unusually heavy strains these war days. To stand up under continuous operation, the sheaves must combine hardness at the wearing surfaces with toughness in the spokes and hubs — contradictory properties not usually possible in a one-piece metal part.

How could these two conflicting metal characteristics be incorporated in the sheaves, without sacrificing either necessary quality?

Oxyacetylene flame-hardening provided the answer. Now the cable grooves, which are most exposed to wear, are given a hard, wear-resistant skin by flame hardening, while the remainder of the sheave retains the required shock-resistance that is already present in the parent metal.

Thanks to the localized protection afforded by this modern preventive treatment, the life-expectancy of the sheaves has been greatly extended, and another threatening operating problem has been nipped in the bud.

Many other equally successful techniques have been developed by Air Reduction service engineers for the application of oxyacetylene flame and electric arc processes to individual manufacturing needs.

If you want to keep posted on some recent developments of oxyacetylene flame and arc processes, write for a free copy of the illustrated booklet "Airco in the News." Please address requests to Air Reduction, Room 1656, 60 East 42nd Street, New York.

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IDLE CYLINDERS ARE PRODUCTION SLACKERS: KEEP 'EM ROLLING FOR VICTORY!

Albert Kingsbury M.E. '99

(*Continued from page* 17)

necticut, after a brief illness.

Inventor of the Kingsbury thrust bearing used on most American warships, he first became especially interested in bearing design and lubrication while in Ithaca. He took out his first patent on a thrust bearing in 1910, and in 1918 established the Kingsbury Machine Works at Frankford, Pennsylvania to manufacture his bearings. For his invention he received the Elliott Cressen medal from the Franklin Institute in 1923 and the John Scott medal of the City of Philadelphia in 1931. Last October his Frankford plant was awarded the Army-Navy "E" for its outstanding contribution to naval architecture.

Mr. Kingsbury was head of the engineering department of New Hampshire College from 1891 to 1899; professor of applied mechanics at Worcester Polytechnic Institute, 1899-1903; mechanical engineer with the Westinghouse Electric and Manufacturing Company, East Pittsburgh, 1903-1910; and since 1910 he had been a consulting engineer in addition to directing his own manufacturing business.

Among honors received by Kingsbury were the gold medal of the American Society of Mechanical Engineers in 1931 and the honorary degree of Doctor of Engineering from the Worcester Polytechnic Institute in 1933.

Gifts

A contribution of $10,000 towards the erection of a new materials and metallurgical laboratory has been made by Frederick D. Herbert of New York City. Herbert, a graduate of the Mechanical Engineering School in 1897, is now president of Keafolt Engineering Company of New York.

* * *

Cornell University has received a gift of $5000 from the will of the late George W. Field of Chicago, the income of the gift to be used to help maintain Cornell's baseball team, President Edmund E. Day recently announced.

Mr. Field made the bequest in memory of his brother Arthur C. Field M. E. '91, life-time sportsman and captain of the Cornell baseball team in 1890 and 1891, who died in Chicago in December, 1930. Always interested in sports, he not only played baseball but also won the University tennis singles championship in 1889, and was a member of the football team. As a memorial to his son who was killed in a plane crash, Leslie McKendrick, M.E. '12, has given Cornell University a $5000 War Savings Bond. The gift establishes the Charles Vance McKendrick Memorial Fund, to be used as the President and Trustees may designate.

Lieut. C. Vance McKendrick, USMCR, died last Feb. 2 near Seeley, Calif. He received the A.B. degree from Cornell in June, 1941, and was commissioned a second lieutenant in the Marine Corps in October.

* * *

The sum of $6000 has been given to Cornell University for the ex-

(*Continued on page* 39)

Attention Freshman Engineers!

DRAWING SETS

to meet the requirements of the Engineering College

Drop in — we'll be glad to show them to you.

Come early — get your choice on used sets.

Free to freshmen — Pamphlet on *"Use and Care of Drawing Instruments"*.

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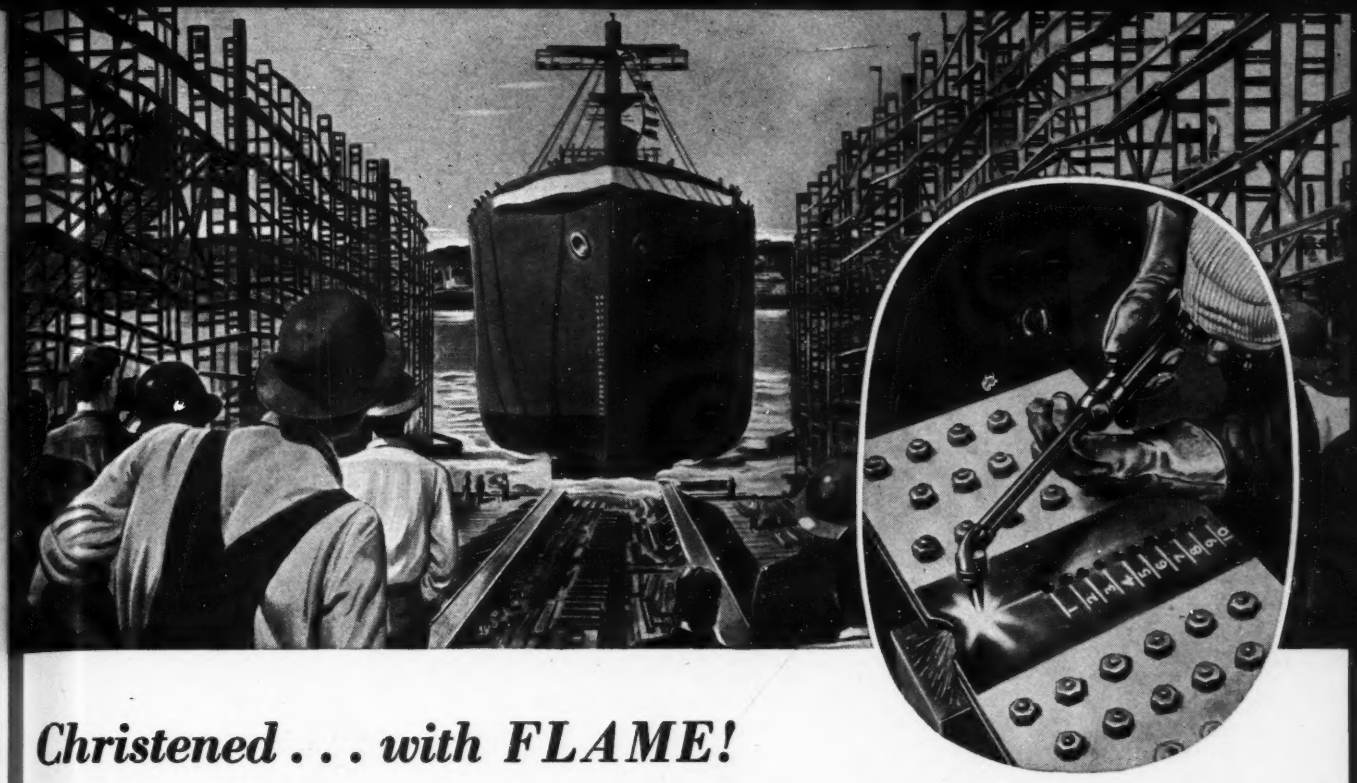
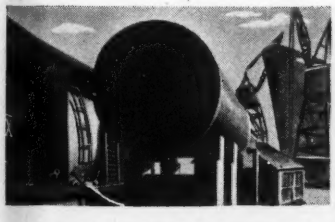


Christened . . . with FLAME!

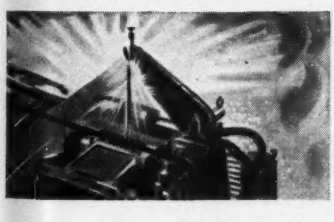
FLAME . . . as well as champagne christens ships. The last act that frees a ship from the ways is the cutting of steel bonds by oxy-acetylene flame. This swift cutting of steel typifies the way the oxy-acetylene flame is speeding the fabrication of ships, aircraft, locomotives, guns, shells, tanks, and hundreds of other vital articles made of metal.

All over America, this flame cuts time and gives to mass-production industries a means of manufacturing faster, better, and at lower cost. Since the white-hot oxy-acetylene flame cuts through metal as easily as a saw through wood, it makes steelworking as simple as carpentry! From the time steel is made . . . until it is finally cut up for scrap and sent back to the steel mills for a new lease on life . . . oxy-acetylene flames expedite its treating, cutting, and fabricating.

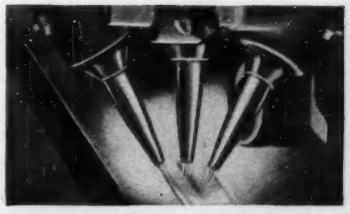
The oxy-acetylene flame is not new. Oxygen, acetylene, and many machines and techniques for treating, cutting, and fabricating metals have been made available to industry for years by THE LINDE AIR PRODUCTS COMPANY, a Unit of UCC. The present wide application of Linde's peacetime research and development . . . coupled with the great expansion of Linde's oxygen-producing and engineering facilities *before* the emergency arose . . . are contributing vitally to this country's mass output of the things it needs. These products and processes—plus new ones that are stemming from today's continuing research — are important among the mass-production tools that can be used in the future to bring you better cars, trucks, tractors, washing machines, refrigerators, and many other things for better living at lower cost.



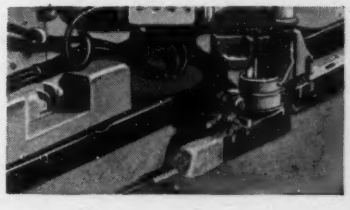
LIQUID OXYGEN! The demand for oxygen today is great. Driox liquid oxygen has made it possible for mass-production industries to be supplied in bulk. Liquid oxygen—occupying only 1/862 of the volume of gaseous oxygen—is shipped in tank cars and tank trucks and converted to gaseous oxygen as needed.



SPEEDING QUALITY STEELS! Production line efficiency in removing surface blemishes from new steel became possible with the Lin-de-Surfacer scarfing machine. Huge mechanized batteries of oxy-acetylene flames "skin" hot steel . . . quickly and economically . . . resulting in higher yields of quality steel.



KNIVES THAT NEVER DULL! Oxy-acetylene flames held in mechanical arms trim and bevel steel plates for welding in a fraction of the time required by methods formerly used . . . cut in straight lines, circles, or in irregular patterns. The flames are also used to harden and soften metals and to prime them for painting.



MECHANIZED WELDING! "Unionmelt" electric welding automatically joins steel plates as much as 20 times faster than any similarly applicable method . . . and does it without noise, fuss, or sparks. This process complements the hand and mechanized methods of welding with the oxy-acetylene flame.

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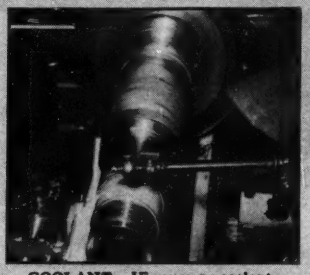
6 STEPS TOWARD TOP PERFORMANCE, WITH CARBIDES, WHEN YOU *CUT STEEL*

CUT AT HIGH SPEEDS—For top performance on the average steel-cutting job, don't cut at speeds less than 200 *feet* per minute. Slow speeds often cause failure.

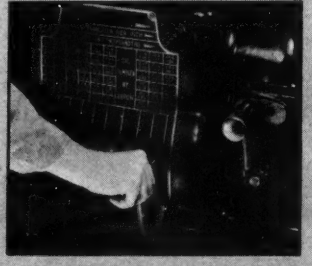
USE CORRECT CHIP BREAKER—When you break chips, break them right. Fit breaker to the job. The ground-in step-type shown is usually best.



COOLANT—*IF* you use a coolant, provide a heavy, continuous stream, preferably under pressure. If you can't provide ample coolant, it is better to cut dry.

KEEP TOOLS SHARP—Avoid running tools until excessively dull. This causes breakage or drastically shortened tool life. Grind tools at regular intervals for best results.

PROVIDE RIGID SET-UP—Keep tools at absolute minimum overhang necessary to clear work. Chuck part firmly. Rigidity is important with carbides.



FEEDS—For medium and heavy cuts on steel, use feed not less than .010" per revolution, and preferably .015" to .025". Light feeds "rub" tool, causing rapid dulling.

● Important in getting top performance, when cutting steel with carbides, are the six steps shown above. When correctly applied, carbide tools produce results far surpassing the performance of ordinary tools. They operate at machine speeds as high as 4 to 5 times faster than ordinary tools, stay sharp up to 10 times longer, and increase output often as much as 300%.

Important, too, is the carbide you use. When you select from the complete line of carbides produced by Carboloy Company, you get the best type for your particular job—whether it be the popularly designated "titanium carbides", "tantalum carbides", "tungsten carbides"—or "tri-carbide" grades.

Send for catalog GT-142 listing specifications and prices of more than 300 standard Carboloy Cemented Carbide tools and blanks for machining all types of metals and non-metallics.

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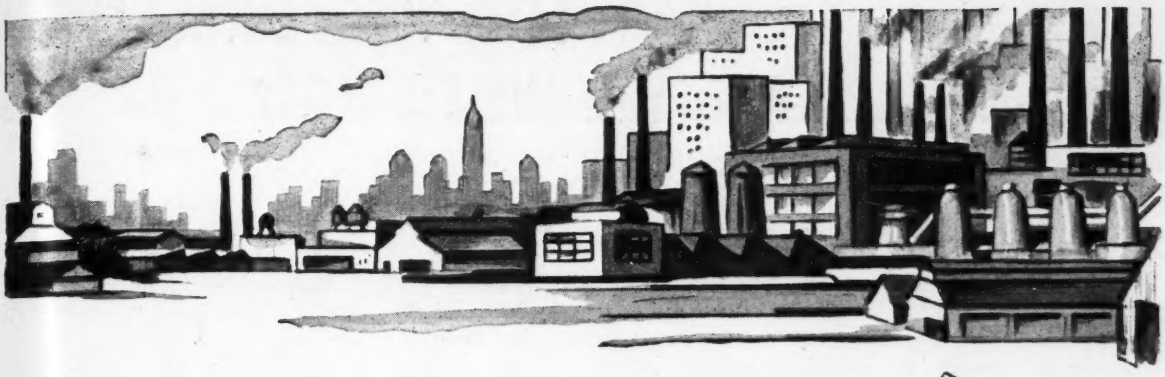
FOR HEAVY HOGGING • HIGH SPEED FINISHING • INTERRUPTED CUTTING • ON ALL STEELS



BOILERS OF THE FUTURE

The pressure of war-time production has demanded of Babcock & Wilcox an ever-greater share of the responsibility for producing boilers for increased-capacity steam generating plants. A large number of Public Utilities, Industrial Power Plants and Ships have been equipped with B & W Boilers of modern design. These improved boilers will be available for FUTURE use in ALL industries. It would be well to familiarize yourself with B & W Boilers NOW.

BOOKLET

"The Design of Water-Tube Boiler Units" is a 14-page booklet that explains what type of boilers are used for various types of service. Copy FREE on request.

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Gifts

(*Continued from page* 36)

press purpose of assisting students in the School of Mechanical Engineering needing financial aid. This sum has been willed by the late Elizabeth M. DeLano of Alplaus, N. Y., near Schenectady), as a memorial for Warren Varney DeLano, M. E. '97. For several years Mr. DeLano was connected with the General Electric Company of Schenectady as a mechanical designer of induction motors.

John Winters Upp, E.E. '89

JOHN Winters Upp, E. E. '89, manager of the General Electric Company's Switchgear Division, died of a heart attack on August 4, at Ardmore, Pa.

As a student at Cornell University, he was a member of Phi Delta Theta and Theta Nu Epsilon. In 1887 he placed second in one event in the New York State Inter-collegiate Athletic Meets and in his Junior year became director of athletics.

In 1901, Mr. Upp joined the General Electric Company where he soon became head of the Drafting Department. In 1907 he was appointed manager of the Switchgear Divisions at Schenectady, Baltimore, and Philadelphia. It was during this work that he became noted for several developments, one of which was the introduction of a metal-enclosed switchgear in the form of removable, enclosed truck panels. These later appeared as metal-clad switchgears. His ideas influenced switchgear developments for over a quarter of a century. Also under Mr. Upp's direction were developed and built many of the first large capacity oil circuit breakers.

Mr. Upp later transferred from Schenectady to Philadelphia, where, supervising the planning and equipment, he helped to centralize a plant in the latter city. He was connected with the Switchgear Division until his retirement in 1933.

During his numerous years as manager, Mr. Upp was a member of the National Association of Manufacturers and the American Institute of Electrical Engineers. A resident of Philadelphia, he was a member of the Union League and the Merion Golf Club.

Army-Navy "E"

THE Ward Electric Co., Mt. Vernon, employing three Cornellians, has received the Army-Navy "E" and an additional star, designating a year of excellence in production for the armed forces.

Sales managers for the company are J. Ward Hunter, M. E., '16; Joseph S. Louden, '27; and Daniel M. Rollins, M. E., '27.

Among the men receiving the Navy and Maritime E were the following Cornell graduates and the companies they work for:

Turner Construction Co.
- DeForest H. Dixon '96
- Egbert J. Moore '99
- W. Burnham Ball '13
- Walter K. Shaw '13

Kidder Press Co.
- Joel F. Sheppard '07

Nordberg Mfg. Co.
- Robert E. Friend '08
- James A. Friend '16

Utica Plant of Savage Arms Co.
- Wilfred L. Wright '00

STRESS and STRAIN...

There was a marine from Vermont who had just landed on Guadalcanal, and seeing the Jap scalps at the belts of the veterans he approached a grizzled top-kick and asked how he could get some scalps.

"It's easy," said the sergeant. "All you do is go out in the brush and set up your tommy gun. Then you yell 'Hirohito is a bastard' and when the Japs come running at you, you just mow 'em down."

So the rookie set off into the woods, and in about half an hour he came back. Seeing he still didn't have any scalps, the sergeant asked him what the trouble was.

"Well," said the marine, "I did like you said, but when I yelled 'Hirohito is a bastard' four Japs stuck up their heads and yelled 'So is Roosevelt,' and dammit man, I just couldn't shoot good Republicans."

* * *

Hostess: "I guess I shouldn't offer you a drink since you just joined the anti-saloon league."

Guest: "It was the anti-vice league I joined."

Hostess: "Oh, I knew there was something I shouldn't offer you."

* * *

A sailor was cast away on a desert island. After he had been there for nine years, he woke one morning to find a lovely young woman had floated ashore on a barrel.

"Heigh ho," she said. "And how long have you been here?"

"Nigh on ten year," said the sailor.

"Gracious," said the woman. "Then I shall give you something that you certainly haven't had in a long time."

"Bust my leg," said the sailor. "Don't tell me you got beer in that there barrel."

—Colorado Dodo

* * *

M. E.: "May I kiss you? May I please kiss you? Say, are you deaf?"

Coed: "Are you paralyzed?"

—Log

* * *

An Ensign was driving the Training School's station wagon through Ithaca, and while glancing at a shapely pair, he lost control of the car and careened into an open air fruit and vegetable market. Before he got things under control again, he had knocked over a bushel of apples, a barrel of potatoes, and stand of beans, a case of oranges, and generally wrecked havoc. When he finally stopped in the middle of the next block and looked back, he saw the merchant standing in the middle of the street by a case of eggs yelling, "Don't bother to come back. I'll kick the damn eggs over myself."

* * *

Voice from passing car: "Engine trouble?"

Voice from praked car: "Nope."

Voice from passing car: "Tire down?"

Voice from parked car: "Didn't have to."

—Froth

* * *

"What's the matter with your finger?"

"Oh, I was downtown getting some cigarettes yesterday, and some clumsy fool stepped on my hand."

* * *

"Do you mean to tell me," the judge said, "that you murdered that poor old woman for a paltry three dollars?"

"Well, judge, you know how it is. Three bucks here, three bucks there,—it all adds up."